The University Library
Leeds

Medical and Dental
Library

30106 004257472

STORE
WS 113
HEL

Presented by the Author

INFANCY
AND
INFANT-REARING:

AN INTRODUCTORY MANUAL.

CHARLES GRIFFIN & CO., LTD., PUBLISHERS.

SIXTH EDITION, Revised. With Numerous Illustrations. 5s.

AN INTRODUCTION TO THE STUDY OF

MIDWIFERY.

For the Use of Young Practitioners, Students, and Midwives.

BY ARCHIBALD DONALD, M.A., M.D., C.M.EDIN.

"No better book could be placed in the hands of the student."—*Sheffield Med. Journal.*

FOURTH EDITION, Thoroughly Revised. With Illustrations. 7s. 6d.

OUTLINES OF THE

DISEASES OF WOMEN.

A Concise Handbook for Students.

BY JOHN PHILLIPS, M.A., M.D., F.R.C.P.

"This excellent text-book . . . gives just what the student requires."—*Medical Press.*

In Pocket Size. Bound in Leather and Illustrated. 10s. 6d.

THE DISEASES OF CHILDREN.

BY GEO. ELDER, M.D., F.R.C.P., and J. S. FOWLER, M.B., F.R.C.P.

"Much more is contained in it than in many books professing more."—*Bristol Medical Journal.*

THIRTY-FIRST EDITION, Revised. With Numerous Illustrations. 3s. 6d.

A MANUAL OF NURSING:

MEDICAL AND SURGICAL.

BY LAWRENCE HUMPHRY, M.A., M.D., M.R.C.S.

"When in doubt, look in 'Humphry.'"—*Nursing Record.*

FOURTH EDITION, Thoroughly Revised. Cloth. 4s.

FOODS AND DIETARIES.

BY R. W. BURNET, M.D., F.R.C.P.

"May be confidently taken as a reliable guide in the art of feeding the sick."—*British Medical Journal.*

FIFTH EDITION, Revised. In Handsome Cloth. 5s.

THE WIFE AND MOTHER.

A Medical Guide to the Care of Health and the Management of Children.

BY ALBERT WESTLAND, M.A., M.D., C.M.

"The best book of its kind. . . . May be read from cover to cover with advantage."—*Medical Press.*

THIRTY-EIGHTH EDITION. In Royal 8vo. Cloth. 10s. 6d.

A DICTIONARY OF

DOMESTIC MEDICINE & HOUSEHOLD SURGERY.

BY SPENCER THOMSON, M.D., and J. C. STEELE, M.D.

Revised and brought up to date

BY ALBERT WESTLAND, M.A., M.D., and GEO. REID, M.D., D.P.H.

"The amount of useful knowledge conveyed in this work is surprising."—*Medical Times.*

LONDON: CHARLES GRIFFIN & CO., LTD., EXETER STREET, STRAND.

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

INFANCY
AND
INFANT-REARING:

AN INTRODUCTORY MANUAL.

BY

JOHN BENJAMIN HELLIER,
M.D.LOND., M.R.C.S.ENG.,
PROFESSOR OF OBSTETRICS IN THE UNIVERSITY OF LEEDS; HONORARY OBSTETRIC
PHYSICIAN TO THE GENERAL INFIRMARY AT LEEDS, CONSULTING PHYSICIAN
TO THE LEEDS MATERNITY HOSPITAL; EXAMINER APPOINTED BY THE
CENTRAL MIDWIVES BOARD; LATE SURGEON TO THE HOSPITAL
FOR WOMEN AND CHILDREN AT LEEDS.

With Illustrations.

SECOND EDITION, REVISED.

LONDON:
CHARLES GRIFFIN & COMPANY, LIMITED:
EXETER STREET, STRAND.
1908.

[*All Rights Reserved.*]

"Nations are gathered out of nurseries."

(CHARLES KINGSLEY.)

UNIVERSITY OF LEEDS
MEDICAL LIBRARY.

602379

PREFACE TO THE SECOND EDITION.

SINCE the first edition of this work was published, the subject of Infant Mortality has come to be recognised as a national question of the first importance. The publication of the *Inter-departmental Report on Physical Deterioration* has contributed to a wide realisation of the momentous fact that the birth-rate is declining, while the rate of infant mortality shows no diminution, and that there is an appalling sacrifice of infant life in our land. Much new and valuable literature has been published on the various aspects of the subject, and, better still, many and various forms of practical effort are being made towards the solution of the intricate problems which the treatment of infant mortality involves.

Keeping in view the same objects as in the former edition, the author has striven to bring the information up to date and to increase the practical utility of the instruction conveyed. He has been careful to indicate various works from which additional information may be obtained by those who wish to pursue further the questions discussed in these pages.

The book has been enlarged and re-arranged, and Appendices have been introduced relating to the work of the Health Visitor.

27 PARK SQUARE,
LEEDS, *February*, 1908.

Digitized by the Internet Archive
in 2015

https://archive.org/details/b21520604

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

PREFACE TO THE FIRST EDITION.

The subject of this book is the maintenance of Health in infancy; not the treatment of disease, but its prevention.

The work is intended, in the first place, for the use of those pupil-midwives and other nurses who seek a scientific understanding of their work, so far as it affects the care of infants. The author does not assume that such readers have much acquaintance with technical terms, and will employ these as little as possible, but he does assume that they want something more than arbitrary rules and disconnected hints, and that they wish for a clear understanding of the principles which must guide their practice.

In the second place, it is hoped that these pages may be useful to those who are engaged in the interesting attempt to diffuse, by means of lectures and classes amongst various sections of the community, some sound knowledge concerning the care of infancy. The enormous infant mortality in our great cities, and the large extent to which maternal ignorance contributes to this, are facts only too easily demonstrable. We look forward to the time when instruction in Infant- and Child-rearing will be recognised as a necessary part of the education of every woman.

Thirdly, the requirements of the student and practitioner have been kept constantly in mind, and to such the references to authorities and some of the notes are principally addressed. With the elementary physiological facts of the subject the student will be familiar, but the practical information here given covers ground where many an otherwise accomplished hospital student finds his education most at fault when commencing practice. In this respect the author has experience as a teacher to guide him, and the clinique of a North of England manufacturing centre supplies abundant practical exemplification of almost every sin against the hygiene of infancy that can be perpetrated. He has not attempted to introduce novel views and methods, but simply to state clearly what is best established and of greatest practical importance.

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

TABLE OF CONTENTS.

PAGES

Preface to the Second Edition, ... v

Preface to the First Edition, ... vii, viii

CHAPTER I.

Normal Growth and Development in the First Two Years of Life.

The New-born Child—Signs of Maturity—Premature Children—Fallacy concerning Eight-months Children—Signs of Recent Birth—Process of Separation of the Cord—Examination of the New-born Child—**Establishment of Functions**—Respiration—Circulation—Rules for taking the Temperature—Fæces—Urine—Suction—Digestive Functions—Digestion of Milk—Weeping—Perspiration—Breasts in Infancy—**The Bony System**—The Skull—**Nervous System**—Inherited Tendencies—**Motor Functions**—Power of Grip in the New-born—**Sensory Functions**—**Special Senses**—Learning to Speak—Moral Sense—Teething—Growth in Weight and Stature—Curves and Tables of Growth—Summary of Two Years' Development, ... 1-32

CHAPTER II.

Difficulties and Problems of Infant-Rearing—Infant Mortality.

Undiminished Infant Mortality in England—Statistics of Infant Mortality—Tables from Registrar-General's Report—International Statistics—Causes of Infant Mortality—Premature Birth—Still Births—Alcoholism—Acquired Deformities not Transmitted—Employment of Mothers in Factories—Parental Ignorance and Neglect—**Overcrowding of Urban Areas**—Want of Fresh Air and Sunshine—Insanitary Dwellings—Poverty—**Insufficient and Improper Feeding**—Disusage of Suckling—Artificial Feeding—Sour Milk—Lister's Discovery—Germs in Milk—**Special Diseases of Infancy**—Gastro-Enteric Catarrh—Thrush—Rickets—Scurvy—Rheumatism—Respiratory Diseases—Convulsions—Table of Causes of Failure to Thrive, ... 33-57

CHAPTER III.

The Prevention of Infant Mortality—Pure Milk Supply.

Recent Work on the Subject—Prevention of Improper Employment of Women—French Institutions—Crèches and Day

PAGES

Nurseries—Instruction in Infant-Rearing—Health Visitors—Huddersfield Experiment Hygienic Leaflets—Philanthropic Associations—Popular Instruction—Earlier Notification of Births—Sanitary Reforms in Towns—Overcrowding—Alcoholism—Infant Life Insurance—Infant Life Protection Act, . 58-65

Pure Milk Supply—Sources of Contamination—Household Supply—Methods of Obtaining it—Milk Depôts in England and France—Sterilisation and Pasteurisation—Myers Coplan's Observations—Germicidal Power of New Milk—Place of Steriliser—Use of Goat's Milk, ... 65-72

CHAPTER IV.

ON INFANT FEEDING.

I. **Natural Feeding.**—Encouragement of Suckling—Quantity of Breast Milk Taken—Frequency of Suckling—Mode—Difficulties—Sore Nipples—Wet Nurses—Soreness of Mouth—Quality of Breast Milk—Regimen for a Nursing Woman—Avoidance of Alcohol—Excretion of Drugs—Weaning, . . 73-81

II. **Artificial Feeding.**—Comparison of Human and Cow's Milk—Constituents of Perfect Diet—Feeding with Cow's Milk—Modification of Milk—Diluents—Cream—Lactose—First Method of Modification—Second Method—Third Method—Frequency and Quantity in Feeding—Difficulties—Playfair's Method—Peptonising Milk—Condensed Milk—Artificial Milk Foods—Sterilisation—Soxhlet's Steriliser—Pasteurisation—The Feeding Bottle—Farinaceous Foods—Malted Foods—Diet after Weaning—Meat - Unsuitable Foods—Summary of Diet in First Nine Months—Diet from Nine Months Onwards—Diet for Rickets—Diet in Scurvy—Constipation—Diarrhœa—Concluding Notes on Diet, ... 82-110

CHAPTER V.

HYGIENE OF INFANCY.

Fresh Air—Open Air—Late Commencement of School—Exercise - Ventilation—Warmth—Nursery—Light—Protection of Fires and Windows, &c.—Cleanliness—Bathing—Clothing—Coverings for the Feet—Exercise—Sleep—Hygiene of Dentition—Vaccination—Hygiene in the Years next Following Infancy—Rearing of English Children in Tropical Climates, . . . 111-127

CHAPTER VI.

ON THE MANAGEMENT OF NEWLY-BORN AND PREMATURE INFANTS.

Newly-born Infants—Establishment of Respiration—Care of the Navel—Prevention of Thrush—Purulent Ophthalmia—**Premature Children**—Tarnier's Couveuse and its Management

PAGES

—Gavage—Amount of Food to be Given to Weaklings—Results of Incubation, ... 128–139

CHAPTER VII.

ON THE SIGNIFICANCE OF CERTAIN CONDITIONS OBSERVED IN INFANCY, ... 140–146

APPENDIX I.

Work of the Health Visitor.—Infant Inspection Schedule—Infant Mortality Schedule—Notes for Health Visitors, . . 147–149

APPENDIX II.

Examples of Health Leaflets, ... 150–156

APPENDIX III.

Signs of Disease in First Ten Days of Life, ... 157

INDEX, ... 159-164

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

LIST OF ILLUSTRATIONS.

FIG. PAGE

1. Sketch of bones of extremities at birth, showing epiphyses (after *Quain*), ... 16
2. Skiagram of hand and forearm to show unossified portions of the bones (original), ... *to face* 16
3. The skull of a new-born infant, showing fontanelles, seen from above (*Donald*), ... 17
4. The same, side view (*Donald*), ... 17
5. Diagram to show the deciduous teeth in position (drawn by *F. Pollard*, from a cast by *Mr. George Brunton*). . . 25
6. Diagram to show individual teeth, ... 26
7. Curve of weekly weighings in a child in the third year of life (from Galton's *Life History Album*), ... 28
8. Chart to show variations in the weight of an infant in the first ten days of life (from *Tarnier*, *Chantreuil*, *and Budin*, with English weights added), ... 29
9. Graphic record, showing the curve of weight in the first year of life, ... 30
10. A typical rickety child (drawn from life by *Mr. J. W. Haigh*), 49
11. The "rosary" of rickets, from a specimen in the Pathological Museum of the Leeds University (drawn by *Mr. J. W. Haigh*), ... 50
12. The breast pump, ... 75
13. Milk from breast when first secreted (after *Gerlach and Tarnier*), 78
14. Microscopic appearance of milk and colostrum (from *Landois and Stirling*), ... 78
15. Diagram to show relative composition of cow's milk and human milk (*Author*), ... 83
16. Soxhlet's steriliser, ... 95

FIG. PAGE
16*a*. Sterilised flask, ... 96

17. Patterns of feeding bottles, ... 97

17*a*. The Hygeia nursing bottle, ... 98

18. How *not* to wheel a baby out (drawn by *Mr. R. F. Reynolds*), . 112

19. A simple form of window ventilator (*Riddell*), ... 113

20. "Shortened!" (drawn by *Mr. R. F. Reynolds*), . . . 119

21. Tracing from foot of a lad six years old who had never been shod (*Author*), ... 120

22. Artificial inspiration, Sylvester's method (drawn by *Mr. J. W. Haigh*), ... 129

23. Artificial expiration, Sylvester's method (drawn by *Mr. J. W. Haigh*), ... 129

24. "Eyes that might have been saved" (leucoma from neglected purulent ophthalmia—drawn by *Mr. J. W. Haigh*), . . 132

25. Tarnier's couveuse—exterior (from *Tarnier*), ... 134

26. Tarnier's couveuse—interior (from *Tarnier*), ... 134

27. Hot-water vessel for warming couveuse (from *Tarnier*), . . 135

28. Apparatus for forced feeding (from *Tarnier*), ... 137

29. Nipple with false palate, ... 144

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

INFANCY AND INFANT-REARING.

CHAPTER I.

NORMAL GROWTH AND DEVELOPMENT IN THE FIRST TWO YEARS OF LIFE.

THE NEW-BORN CHILD—SIGNS OF MATURITY.

After nine months' development within the womb, the child is ready for independent life in the world outside, and in due course the muscular walls of the womb expel by a more or less difficult and painful process first the child, and then the structures which have hitherto enfolded it and connected it with the maternal organism. The following are the signs which show that the proper degree of development has been reached, and that birth has not taken place too soon :—

The Average Length.—The new-born child should have an average length of 51 centimetres, or 20·4 inches, the extremes being 48 to 54 centimetres, or 19·2 to 21·6 inches.* A length of 24½ inches has been recorded.† On the other hand, in cases of twins and triplets, full-term children of much less size have been noted. Rering gives a case where a twin measured 31·5 centimetres or 12·6 inches.‡

The Average Weight is 7 lbs., rather less in females and more in males. Variations between 6 lbs. and 8 lbs. are very common. A weight of 10 lbs. is uncommon, and of 12 lbs. most exceptional, but even greater weights are on record, and A. Martin, of Berlin, extracted a dead child which weighed fully 8 kilogrammes or 17·16 lbs., and Cazeaux reports a case where the weight reached 9 kilogrammes, or 19·8 lbs. Extreme size involves proportionally great risk of still-birth, for when the child's head reaches a certain size, it cannot pass the bony passage within the hipbones without serious or fatal injury. The world has doubtless lost some of its greatest geniuses because their brains were too large for safe delivery. The average width of the shoulders is 11 cm. (4·4 inches), and of the hips 9 cm. (3·6 inches).

---

* Winckel, *Handbuch der Geburtshülfe*, 1903, I., i., p. 293.
† Galabin's *Midwifery*, chap. v.
‡ *Praeger Med. Wochenschrift*, 1889, No. 25.

On the other hand, new-born children may weigh less than 6 lbs., or even as little as 5 lbs.; but in these extreme cases the child is most probably premature, or, if not, it is so puny and weak that its chances of surviving are very slight.

The Toe Nails should come well to the end of the toes, and the finger nails should slightly overlap the ends of the fingers, being a little more developed than the toe nails.

This is but one illustration of the interesting fact that in the unborn child the **upper extremities** develop more rapidly than the lower, so that at birth the arms are far more powerful and capable members than the legs. It will be a year before the child can walk, but already the strength of its grip is extraordinary. It will also be found that in children born prematurely, the legs are relatively too short. The centre of the body should come just above the navel. If it lies higher than this, immaturity is indicated.

The Skin of the mature child shows certain characteristics. It is reddish, but whiter than in the premature, in whom it is dusky or purplish-red. In the fifth month of womb life, the skin is covered all over by short down (*lanugo*). In this some see the traces of the hairy skin of earlier stages of evolution. After the fifth month, the lanugo begins to come away, and one of the signs of maturity is that there should be hardly any of this left except upon the shoulders.

A kind of cheesy varnish (*vernix caseosa*) covers the skin at birth to a greater or less extent. It consists of the secretion of the glands of the hair-follicles mixed with epithelial scales and lanugo, which have been shed.

Fat.—There should be a fair amount of fat beneath the skin, giving a full rounded outline to the limbs; whereas premature children are apt to be thin, their limbs flaccid, their bony points prominent, and their faces wrinkled and old-looking. This deficiency of superficial fat renders them less able to resist cold.

Both the Testicles should be in their place. These lie within the abdomen until two months before birth, and then descend, but it sometimes happens that at birth one or both have not yet descended. They will almost always make their appearance later, and have often under such circumstances been mistaken for rupture. We have known a truss actually applied to keep the supposed rupture within the abdomen. At the same time, we may mention that the descended testis often lies at the upper part of the scrotum and almost in the groin.

At birth the child should cry vigorously, the movements of the limbs should be active, and the grip of the hand strong.

Proportion of Males to Females.—According to the latest Report of the Registrar General 1,036 males were born for every 1,000 females in 1905. Four per cent. of all births are illegitimate.

PREMATURE CHILDREN.

Seven months has been shown by experience to be the earliest age at which a child prematurely born has much chance of surviving. Born before twenty-eight weeks, it will probably die in a few hours or days. We shall, however, give some account hereafter of the marked success that has attended the system of rearing premature children practised by Tarnier and Budin, and others of the French school (see Chapter vi.).

A Seven-Months Child will have an average length of 15 inches and a weight of 45 ounces. The body is very thin and slender, the skin uniformly red in colour, and transparent, so that its vessels are easily seen. The finger nails fall short of the finger tips, and the toe nails are still more rudimentary. Down covers the greater part of the body, being least marked on the face. The cry is feeble, shrill, and monotonous, and the breathing is feeble. In watching the breathing movement, it will be seen that the chest walls move very little, and that it is chiefly the abdominal walls which rise and fall. The child's limbs move slowly and feebly. It is torpid, and has hardly strength to suck, and what is still more important, there may be a serious defect of swallowing power.*

Eight-Months Children present intermediate characters. Their average length is 16½ or 17 inches. Their average weight is 4½ to 5 lbs.

There is a very old traditional belief that eight-months children have less chance of surviving than those born at the seventh month. The contrary is the fact, as might be expected. Tarnier, for instance, before the employment of his improved methods of rearing premature children, found a mortality of 78 per cent. amongst seven-months, and 39 per cent. amongst eight-months infants. But the belief, which is not extinct even to-day, can be found in writings attributed to Hippocrates,* and also in the Talmud. It seems probable that an old superstitious belief in the mystical power of the number seven may be the real foundation of a legend which has been accepted by generation after generation for more than two thousand years, and which the writer has himself heard repeated with all seriousness by members of the profession.

---

* See Guéniot, *Gaz. des Hôpitaux*, Oct. 22 and 29, 1872.

SIGNS OF RECENT BIRTH.

The new-born child will show signs of recent birth. The head will in almost all cases show a temporary alteration in shape. This is due partly to the actual moulding of the bones of the skull during the process of birth, the head becoming longer from before backwards, and partly to a soft swelling which forms during labour upon the part of the head which is lowest just before birth. This becomes swollen because every other part of the head is more pressed upon and squeezed than this. Hence it is called *caput succedaneum.* After a difficult labour the **disfigurement of the head** may be most marked; but the child's head will resume its natural shape, and the swelling will disappear in a day or two, so that there is no cause for anxiety, and no need for treatment; and especially is there no need for the nurse to try to press the head into shape with her hands. She had far better leave it alone. If the child be not born head first, a similar swelling may be seen in some other part of the body, the buttocks for example. In rare cases there is found upon the head a birth-swelling, which does not quickly go away, but which on the contrary may grow larger after birth, and may become of stony hardness, and not disappear for three months or more. This is a blood tumour under the scalp, and is due partly to injury during birth, and partly also, in all probability, to some obstruction of the circulation of the blood at the same time.† Spontaneous cure may be expected, and most cases are best left untreated.

Attached to the navel of the new-born child is the remnant of the **navel-string.** This will dry up and mummify, becoming hard and horny; for after it is tied at birth, blood soon ceases to enter it, its blood-vessels shrink up, and it becomes quite lifeless. It will come away usually in five or seven days, but it may remain attached for a much longer period. We have seen it remain for twenty-one days.

---

* See the New Sydenham Society's *Hippocrates,* vol. i., p. 96. It is not certain whether Hippocrates himself is responsible for this teaching, but its antiquity is undoubted.

† On the asphyxial theory of cephalhæmatoma neonatorum, see an article by Merttens, *Zeits. für Geb. u. Gynäkol.* Band xxiv., Heft 2. Abstract in *Med. Chronicle,* November, 1892.

The process by which the cord-remnant separates is interesting. A little red ring is seen to form where the cord joins the skin, then by a process of natural ulceration a furrow is formed, which deepens until it cuts off the stump. As the place of attachment contracts meanwhile, the raw surface left when the stump forms is small, and is usually overlapped by a fold of skin. There will be a little thin discharge during the ulceration. Drying up is the normal process, but sometimes, especially in children who are not in good health, the drying up of the cord is delayed. In these cases the stump may become slightly offensive (see also p. 129). When the cord has fallen, and the navel has healed, the infant is no longer classed as a *new-born* child.

EXAMINATION OF THE NEW-BORN CHILD.

The new-born infant must be examined to see whether it is free from **defects and malformations.** Of gross malformation or monstrosities we will not speak here, but the following are points which should be noted in the routine examination just after birth. They relate to defects which are more or less remediable by surgical means. There should be no cleft of the lip (hare-lip) or of the palate. The fingers and toes should be perfect in number. The fingers should be duly separated from each other, and not "webbed." The feet should not be contracted or "clubbed."

The general outline of the head, neck, trunk, and limbs should be normal. There should be no swelling along the spine. The genital organs should be well formed, and quite distinctive of the sex. The testicles in the male should be in their place, and there should be no rupture in the groin. The opening of the bowel (anus) should be normal, and urine and motions should pass in a few hours; occasionally the anus may be normal, but the bowel obstructed inside. There should be no abnormal marks upon the skin. We may say, however, that a very large number of infants do have upon their skins red stains (cutaneous nævi) more or less distinct. These are popularly called "mother's marks," or "birth marks," and ignorant people suppose that they are produced during labour, and we have even had them pointed out as the place where the accoucheur had "put his fingers." They usually disappear of their own accord in a few months or, at most, in a year or two. It is only when the nævus rises up above the level of the skin, and after a month or two is found to be growing larger, that treatment by the surgeon is needed.

The skin of a new-born infant has a reddish colour of varying depth, which in three or four days will begin to fade, and the skin may then assume a more or less yellowish tinge, but this is not of serious importance. There is a jaundice of the new-born which sometimes occurs, and which is of more serious nature. This is recognised by the fact that the whites of the eyes become yellow, and the urine has the same colour.

Blueness of the skin, especially on the face and extremities, is a sign of defect in respiration or circulation, or both.

In two or three days a slight peeling of the skin will be noticed, and especially on the chest and belly. This will go on more or less for a month or six weeks. It occurs later in premature children (*Parrot*). The scalp of the infant is the densest and least delicate part of its skin. The **hair** at birth varies in amount. Sometimes it is scanty, sometimes long and dense. Often the first hair will be replaced at an early date by a shorter and thinner growth.

We have not here space to discuss the internal anatomy of the infant. It presents many points of interest—as, for instance, the larger size of the **Thymus gland**, which lies behind the upper part of the breast bone, reaches slightly into the neck, and measures from 1·6 to 2 inches from above downwards. It remains large for two years, and then begins to atrophy. The process of atrophy is usually completed by the ninth or tenth year. Again, the **liver** of the infant is relatively very large, and occupies nearly half the abdominal cavity. The **bladder** in children lies much higher than in adults, and is more directly under the control of the abdominal walls. The position of the bladder is of great importance in surgery. But we must refer the professional reader to more detailed works on the subject.*

ESTABLISHMENT OF FUNCTIONS.

Respiration.—The child usually begins to breathe spontaneously as soon as it is born. Up to the moment when the navel-string is tied, or the after-birth is detached from the womb, it lives without breathing, but at this time it must

---

* See especially a valuable work by Ballantyne, *Introduction to the Diseases of Infancy*. This book, which is illustrated by frozen sections, &c., contains much information and good original work.

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

begin to breathe or die. The principal causes of death of the child during labour are pressure on the cord which stops the circulation before the child is born, or else injury to the head which paralyses the nerve-centre for breathing. Truly, at the moment of birth life seems to hang by a marvellously slender thread, but in an uninjured child who is duly cared for, the lungs will assume their function with a wonderful degree of certainty. The causes of the beginning of breathing are, first, the need of air. Throughout life nothing excites more violent efforts to breathe than venous blood acting on the breathing centre. Secondly, the sudden exposure of the warm skin to the cold air, which is perhaps 40° colder than the interior of the womb. The involuntary gasp caused in the adult by a cold douche to the spine illustrates the power of this stimulus. Thirdly, the sudden liberation of the child's body from pressure helps the chest to expand and draw the first breath. A vigorous cry is the usual sign of established respiration, and the strength of the cry is a good index of the child's vitality (see Chapter vi.).

When the breathing is established, what are its **rate and characters**? The rate varies, and is easily disturbed by slight causes.

The average at birth is about 44 per minute.
,, in the early months, 35 to 40 per minute.
,, at the end of the first year, 28 per minute.
,, in the third and fourth year, 25 per minute.
,, in the adult, 16 to 18 per minute.

Respiration is, as a rule, slower during sleep in infancy. Parrot found it to be slightly more frequent in 34 cases of new-born children observed by him,* but the rule is as here stated.

The breathing of infants is "abdominal" in type, that is to say, the rise and fall of the front of the abdomen is relatively more marked, and the rise and fall of the chest-wall relatively less marked, than in the adult, and so also the sides of the chest expand very little in the infant. As the child breathes the respiration should be quiet, and especially should the inspiration be noiseless. A noise on drawing in the breath points to spasm or obstruction in the larynx. The nostrils should not markedly dilate, and as the child draws its breath there should be no sinking in above the breast bone, or at the pit of the stomach, or at the sides of the chest.

---

* Vierordt in Gerhardt's *Handbuch der Kinderkrankheiten*, vol. i., 2nd edition, 1881.

It is a very good thing for a nurse to observe the rate and characters of the breathing of each individual infant. Respiration is best counted by laying the hand on the abdomen and counting for more than a single minute. Fever quickens the breathing, so does any lung affection—*e.g.*, bronchitis. When a child has bronchitis, one can often judge whether it is better or worse by noting how the rate of breathing alters. Infants do not expectorate. Any phlegm that rises from the lungs is swallowed, but it may sometimes be vomited subsequently, as in whooping-cough. Children ought to breathe through their nose without a constant snuffling noise, and without any obstruction.

Circulation.—Important changes take place in the circulation at birth, which are described in every work on physiology. The principal one is the closure of the oval aperture between the two auricles of the heart.* The sign that this has failed to take place properly is, that, after breathing is established, there is blueness of the face and especially of the lips, also of the hands and feet, seen best in the finger nails. This may be soon rectified spontaneously, but occasionally the closure does not take place, and the blueness of face and limbs remains as a permanent feature, constituting what is called *Morbus Cœruleus* or the *Blue Disease.* Some other varieties of congenital defect may produce the same condition. Such children are very seriously handicapped, and few of them survive more than a few months, or years. They are very likely to succumb to any disease which may attack them, and are especially liable to bronchitis. There is no cure for the condition, but special precautions may help to prolong their life. For example, they need warmth, and a mild equable climate, and must be kept in a uniform temperature and warmly clothed. The diet must be simple and well regulated, and they must be prevented from over-exertion and from excitement. Over-heated and ill-ventilated rooms must be avoided. Gentle exercise and massage may be recommended.

One of the symptoms of this condition is clubbing of the finger ends, but this may also be seen in lung disease.

The **pulse** in children is much more variable than in adults, and its rate is easily altered. Crying, for instance, may send it up ten or twenty beats, and sucking also will accelerate it. It is not easily felt at the child's wrist, and the nurse will do better to count the heart beats. Estimates of the average frequency of the pulse in infancy vary; we may take the average at birth to be about 130, but a pulse of 150 could not be called abnormal. It is faster in girls than boys; during the first month it will range from 120 to 140. Trousseau gives the average for the first two months at 137. From the second to the sixth month, 128; from the sixth to the twelfth, 120; and from the twelfth to the twenty-first, 118.

---

* Obliteration of the foramen ovale. This is said to close at birth. This means that the passage through it of blood ceases. As a matter of fact absolute closure is delayed for months or even years, but though there is potentially a small passage during this period, the admixture of venous and arterial blood ceases at birth. Da Costa Alvarenga, *Gaz. Méd. de Paris*, 1870, p. 104. Parrot, *Clinique des Nouveau-nés, Athrepsie*, p. 14.

In the second year the pulse will average about 110, and in the third year it will be between 90 and 100, and will continue at this rate until the sixth year.

Owing to the variability of the pulse, the respiration and temperature also must be taken into consideration before a reliable conclusion can be reached.

The **temperature** of a child is a point of great importance, as an infant cannot describe its symptoms; and as much experience is needed to estimate the value of various objective signs, it is of much value to nurses and parents to be able to use the clinical thermometer for exact observation.

Rules for Taking an Infant's Temperature.

1. Be sure that the thermometer is surgically clean, for infection may be conveyed from child to child by carelessness in this respect. Instances have been known where infective vulvitis has spread in a children's ward when a series of rectal temperatures have been taken with an infected thermometer.
2. Shake down the thermometer index till it marks between 96 and 97.
3. Oil the bulb, and, placing the child on its side, gently pass the thermometer bulb 2 inches within the bowel. Then hold the instrument and the child steadily for five minutes.
4. Remove thermometer, read the temperature, and record it at once in writing; the best plan being to record it on a chart.
5. Wash instrument carefully, but not in hot water, and disinfect it.
6. The thermometer may also be held in the mouth. The axilla and the groin are also available. They will give a temperature from ½° to 1° below the mouth or rectum, but unless the observer can be sure that the bulb is thoroughly in contact at all points with the skin, the observation will not be reliable.

The rectal temperature at birth is 100° F. Then it falls in a few minutes about 3°. It may fall lower if the child be weak and feeble, and much lower if the function of breathing be delayed or insufficiently established. In a few hours it will be from 98·8 to 99, which may be taken as the normal standard. The temperature will vary during the day, being lowest in the small hours of the morning, and highest at about six in the evening. The range of variation has been found to be about 2° F. (*Finlayson*), 1·2° F. (*Sturges*).

It may be granted that amongst the wonders of physiology is the power which the human body shows of regulating its heat, and of maintaining an almost uniform temperature from mid summer to mid winter, and from the poles to the tropics, but it must be clearly understood that in infancy the temperature is more easily disturbed than in the adult. **Children easily lose heat from the skin**; they cannot stand the exposure of large tracts of skin to cold air, and they soon take cold. To the premature and weakly infant loss of heat from the skin is specially fatal, and in the healthiest child the clothing must be adapted to prevent undue loss of heat from the skin.

The heavy infant mortality from disease of the respiratory organs is really an object lesson on this subject (see Chapter ii.). In old age there is a similar difficulty in maintaining the heat of the body.

The temperature in infancy is easily elevated, and, from a given cause, will rise much higher in the infant than in the adult. Hence a sudden **elevation of temperature** in childhood is of itself far less alarming than in later life. To guide the nurse's judgment we may say that, if the thermometer reads below 98, it may mean that the child's vitality is depressed, but it is more likely that the temperature has not been properly taken. Try again, putting the bulb in the rectum. If it reads from 99 to 100·5 the child is somewhat feverish. If from 100·5 to 102 there is decided fever. If from 102 to 104 the fever is very high, but in itself not so very serious if it comes down soon. If above 104 anxiety must be felt, but temperatures of 105 are often seen at the onset of specific fevers in infancy. Above 106, dangerous and fatal conditions must be feared unless there be a very speedy fall, and 107 is most exceptionally high, and the case grave in the extreme. Before giving way to alarm, make quite sure that the index was actually shaken down before the instrument was used. We have seen some extraordinary temperatures recorded by thermometers which had been accidentally heated on a hot surface.

The Fæces.—The first motions in a new-born child are different from those passed at any subsequent time. Before the child is born, and while it is still nourished only through its mother's blood, its intestines fill up with a dark brownish-green or nearly black fluid, which is called **Meconium.** This begins to accumulate two or three months before birth, and consists of materials from the bile, of mucus and scales from the bowel coat, but, of course, it cannot contain any remnants of food from the stomach. It is a matter of interest to know that it contains no Bacteria,* so that it is not septic or liable to cause blood poisoning. The amount of meconium is estimated by Depaul to vary from 30 to 127 grammes, giving an average of 74 grammes (2·6 ozs.). Most of this will pass away in the first twelve hours, but the evacuation will not be completed for three or four days. Hence, the dark and peculiar appearance of the first motions of an infant must be regarded as a healthy and normal sign. But an ignorant nurse often declares that it is necessary to give a purgative to clear away this meconium, and hence, before the unfortunate child has been an hour in the world, it receives a dose of castor oil—a dose which will be repeated subsequently on the slightest pretext, for this drug is a popular cure-all for the ills of infancy and childhood.

In three or four days the *stools* of the child will become bright yellow, uniform in consistence, and like thick soup, and almost without smell. At first there should be two to four motions daily, later one or two. If there are many more than this, if they are green and offensive, or if they are pale and putty-like, or filled with curd and undigested milk, the stools are unhealthy; still more so if they contain slime and blood.

The first milk which comes in the mother's breasts after labour is slightly purgative in its action, and is called **Colostrum.** Tarnier says that it makes the stools of less consistence and gives them a greenish colour, which may last for some time, so that the natural yellow colour is seen earlier when the child is suckled by a wet-nurse than when its own mother gives it the breast.† Bouchand says that the weight of fæces evacuated daily by an infant at the breast is about 80 grammes (or 2·8 ozs.), whilst the average for an adult is 170 grammes (5·9 ozs.). The fact that an infant swallows so much and absorbs so little accounts for the above relatively-high proportion.‡ Towards the end of the second year the motions should be formed, and have a colour and odour approaching to what is observed in adults.

---

* Escherich, *Zeits. für Geburtskunde.* Quoted in Booker's article on "Micro-organism in the Intestines," in vol. iii. of Keating's *Cyclopædia of the Diseases of Children.*

† *Allaitement et Hygiène des enfants nouveau-nés*, p. 31.

‡ *Ib.*, p. 33.

The Urine.—It is not easy to say much which is of practical utility concerning the urine of infancy. Urine should be passed within a few hours of birth; after this the child will pass it at frequent intervals into the diapers, and it is no easy matter to collect the urine for examination. It should not stain linen, and should have very little odour. Its specific gravity is low. Its reaction is slightly acid or neutral. It contains no sugar, and should not contain albumen. Albuminuria in an infant must be regarded as a sign of disordered function. The quantity passed is small in the first three days. Parrot and A. Robin estimate that from the sixth to the thirtieth day the amount passed is 5¼ to 10½ fluid ounces. During the first year it rises from 14 to 17½ fluid ounces. In the second year it varies from 17½ fluid ounces to a pint or more. An infant passes relatively more than an adult; but then an infant lives on fluid food.

The principal question for a nurse is, when will the infant acquire voluntary control over its bladder?

There is great difference between children. From six months onwards the nurse may notice an increase in the number of hours that the child keeps dry, but the final cessation of incontinence by night or day may be indefinitely postponed even after infancy is over. But in this matter regular feeding and regular holding out will do much to bring about early cleanliness of habit.

The function of **suction** is performed instinctively from the first. On consideration it will be seen that this is one of the most important of all the functions of the infant. It is performed by the action of the tongue in the mouth. The lips close around the nipple, the soft palate and pharynx close the mouth behind, the jaw is depressed, and the tongue is drawn backwards and downwards, acting like a piston. A potential vacuum is formed in the cavity of the mouth, so that the atmospheric pressure tends to make the cheeks fall in slightly, and in the same way the milk is forced into the mouth. When the mouth is full the contents are swallowed, and the process is repeated. Sucking is interfered with by hare-lip and by cleft palate.

To what extent is the power of sucking interfered with by *tongue-tie*, or undue shortness of the bridle of mucous membrane beneath the tongue? Old-fashioned nurses find a great proportion of infants to be tongue-tied. Recent authorities declare that, even if the bridle is short, it never causes any harm, and that it is useless to divide it.* We believe that the truth lies between these extremes. Rarely is shortness of the *frænum*

---

* Tarnier, Chantreuil, and Budin, *Op. cit.*, p. 185.

linguæ of importance; occasionally it may be divided with advantage. A surgeon must perform this little operation, for serious hæmorrhage might follow if certain blood-vessels were divided.

The easiest way to expose the tongue-bridle for observation and treatment, is to compress the child's nostrils, when it will at once open its mouth and cry, putting the tongue on the stretch.

The **Saliva** in infants is at first of very small amount, especially in the first two months. It becomes more abundant when teething begins. Now the chief function of saliva in the adult is to help the digestion of starch by turning it into grape sugar. In infants not only is the saliva scanty, but its starch-digesting power is, though not absent, slight and inadequate. Hence follows a most important principle for infant feeding—viz., that **starchy foods cannot be properly digested in early infancy.** There is only too much evidence of the ill effects of neglecting this principle. And we may add, that the secretion of the pancreas, which in the adult has powerful starch-digesting power, shows also a marked deficiency of that power in infancy. On this ground we must further emphasise the principle just laid down.

The **stomach** of an infant is of *small capacity.* At birth it will contain only about two tablespoonfuls; at the end of a month it will hold five tablespoonfuls; at the end of two months, 3 fluid ounces and 1 or 2 drachms. After this it increases in capacity more slowly. At five months the capacity is about 4 ounces, at seven months about 5 ounces, at twelve months 7 ounces, and at the fourteenth or fifteenth month the stomach will hold about half a pint. Some authors give a higher estimate. Hence the stomach of an infant is soon full, and when over-full easily relieves itself by rejecting its contents. In consequence of this a certain amount of vomiting is natural to an infant, as natural as crying.

> . . . "At first the infant
> Mewling and puking in its nurse's arms."

The muscular movements of the stomach walls also are feeble at this age.

On the Digestion of Milk.—When milk enters the stomach it rapidly becomes *curdled* by the action of the gastric juice, and, if the infant should vomit the contents, abundant, soft flocculent curd will be seen. The infant's stomach is said to curdle the milk more rapidly than that of the adult. It will be remembered that in the dairy cheese is made by employing the "rennet" of an animal's stomach to turn the milk into curds and whey. This is in principle the same process which we have just described as the first stage in milk digestion.

The second stage is the *peptonising* of the curd. This implies dissolving it and changing it into a form that can be easily absorbed by the coats of the bowel, and it is accomplished by the gastric juice by virtue of the pepsin which it contains. By the time the milk leaves the stomach it is converted into a creamy acid chyme. The peptonising process goes on best when the milk is well diluted with water.

It will be seen hereafter that certain classes of artificial foods for infants are prepared by imitating the starch-converting power of the saliva, and also by reproducing outside the stomach the peptonising action of the gastric juice.

During digestion lactic and hydrochloric acids are poured out into the stomach, and this is why hydrochloric acid has been sometimes used for artificial digestion.

Such artificial foods have their use in sickness, but it is by far the best thing for the digestive organs to do their own work, if possible. In the intestines the above processes are continued and completed. The peptonising is accomplished very thoroughly, the pancreatic and intestinal juice assisting, and the peptones are easily absorbed. The starch transformation is completed by the pancreatic and intestinal juice, and, perhaps, to some extent by the bile. The fatty materials are emulsified and made easy of absorption by the action of the bile and the pancreatic juice. There is plenty of bile in infancy, and infants take cream and other fatty materials very well. Young children will often drink cod-liver oil from the bottle neck, and ask for more.

The reasons why *infants cannot take meat and other solid food* are these :—

They are without teeth, and these are necessary to accomplish the first stage in the digestion of solid food, which consists in grinding it to a pulp. The walls of the stomach and intestines are weak, and are not equal to the vigorous movements required for the propulsion of the more solid contents. The digestive juices are at first scanty in quantity, and feeble in action, as far as the digestion of solid is concerned. It does not follow from this that infants cannot digest the juice of meat; on the contrary, this can sometimes be administered with great advantage, as we shall show hereafter.

Weeping.—At first infants cry without shedding tears. Darwin has published some observations on this point. In one

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

case, tears first ran down the cheek on the 139th day. In another, the eyes were slightly suffused at 20 days. In others at 62 days, 84 days, 110 days, 42 days respectively. Hence the date of the first weeping is variable.*

Perspiration.—There is not much perspiration at first from the skin. This function gradually becomes established after a few weeks. Nevertheless, infants may perspire when too much wrapped up. In rickets, perspiration from the head is a very prominent symptom, and when there is lung disease and imperfect oxygenation of the blood, the sweat is often copious.

In the **breasts** of new-born children a curious phenomenon is sometimes noticed. These glands contain milky fluid, and this occurs as often in males as in females. The Germans call it *Hexenmilch* or witch's milk. It appears from four to ten days after birth, and it may continue for four or five weeks. By most authorities it is held to be real milk.

Sometimes an abscess forms in these milky breasts. Many ignorant nurses deliberately squeeze the infant's breasts daily to get the milk out. This treatment will very likely cause inflammation and abscess, and when the abscess is healed the nipple may become retracted, and in after life be practically useless for suckling. Such abscesses are caused by the entrance of disease germs through the nipple (see p. 76).

If the breasts are not much swollen and not reddened, they are best left alone, being protected by a pad of cotton wool secured with strips of plaster. If they seem inflamed they need fomentation or belladonna plaster. If an abscess forms this must be treated surgically.

THE BONY SYSTEM.

Few features in the development of the child are more interesting or more important than the formation of its bones. At birth there is not a fully solidified bone in the body. The skeleton may appear complete in form, but the bones composing it consist more of gristle or cartilage than of hard bony material: cartilage can be cut with the knife, which bone resists; cartilage can be bent, bone is firm.

In a healthy child, placed in healthy surroundings, and fed on proper food, the bone-formation, or ossification, advances rapidly in the skeleton; but under adverse conditions bone-making may progress slowly and imperfectly. The skeleton may become deformed, especially in the limbs and chest, and when the ossification is complete the child may be permanently disfigured by bent limbs, misshapen chest, and other deformities. To this most important subject we shall return when we speak of rickets (see p. 48). We will in this place only speak of the normal development of the bones. Ossification starts in the cartilaginous bone at one or more points, which are hence called centres of ossification, and the separate portions of bone thus developed are ultimately all blended together, and then the bone is complete; but many of the bones are not finally solidified until adult age. The separately formed portions of bony tissue found at the extremities of the bones (see Fig. 1) are called *epiphyses*. In Fig. 2 is a reproduction of an x-ray photograph of the hand and forearm of a young child, including the elbow. The bones appear not to meet at the joints, because the ends of the bones being still unossified are translucent to the x-rays. The partially ossified epiphyses are seen separated from

---

* *Expression of Emotions in Men and Animals*, chap. vi.

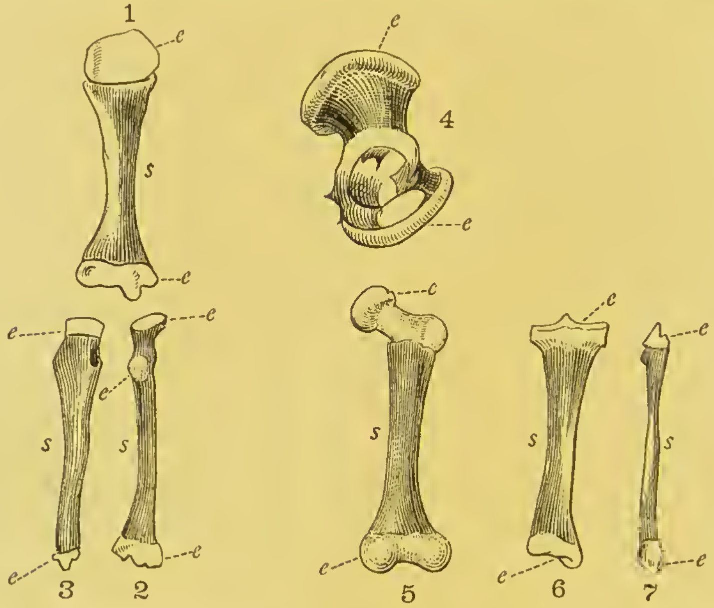

Fig. 1.—Sketch of bones of extremities at birth, showing epiphyses (after *Quain*).

1. Humerus.
2. Radius. } Bones of arm.
3. Ulna.

4. Hip-bone.
5. Femur. } Bones of leg.
6. Tibia.
7. Fibula.

s = shaft of bone.
e = epiphysis.

[*To face p.* 16.

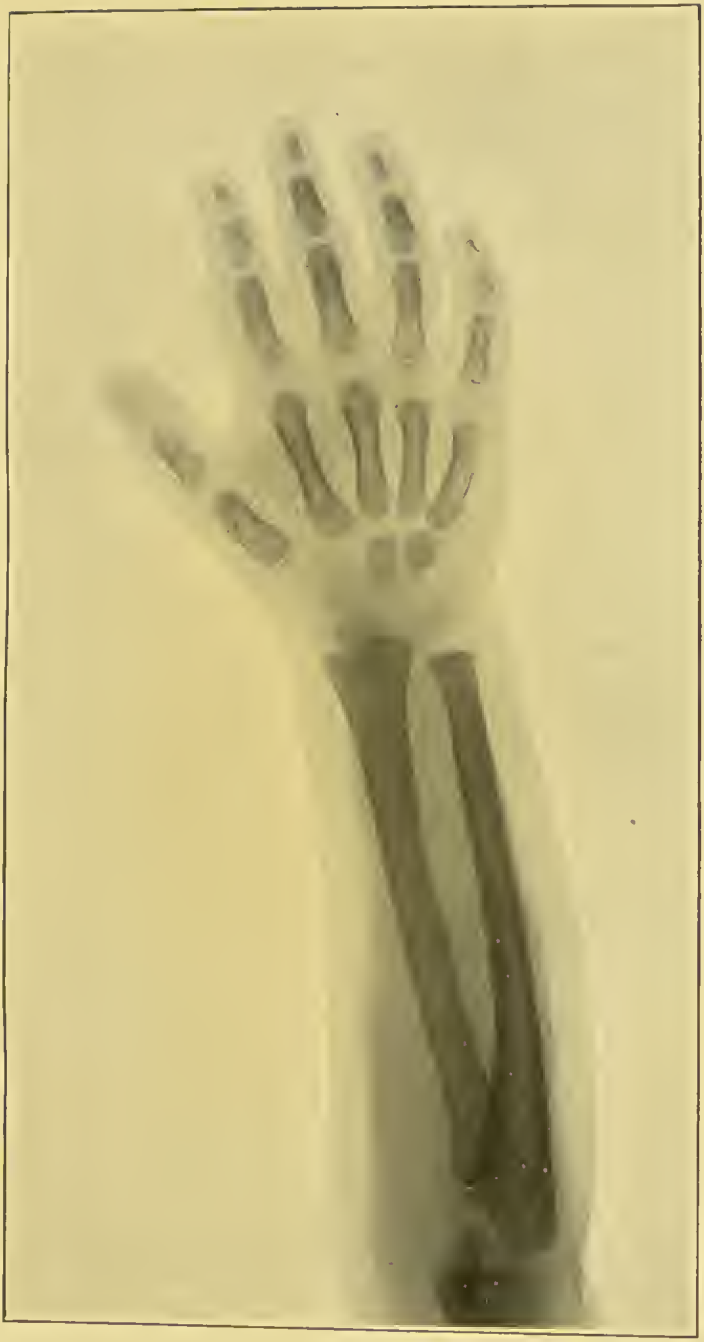

Fig. 2.—Skiagram of hand and forearm of young child, showing translucency of unossified extremities of the bones.

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

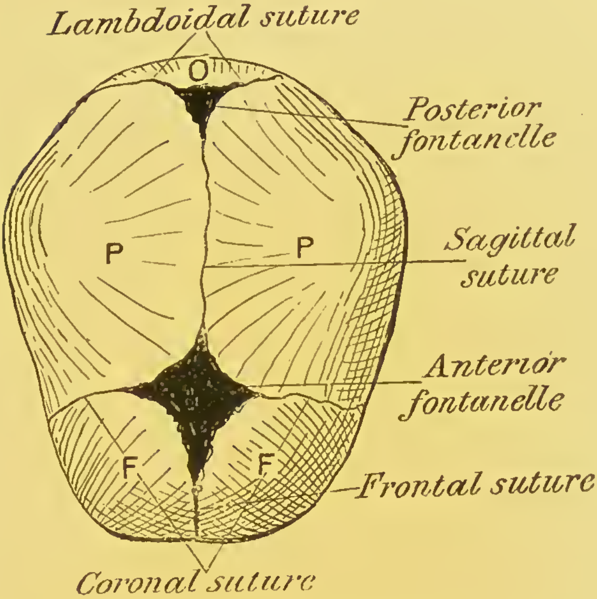

Fig. 3.—The skull of a new-born infant showing fontanelles, seen from above. O, occipital bone; P P, parietal bones; F F, frontal bones (after *Donald*).

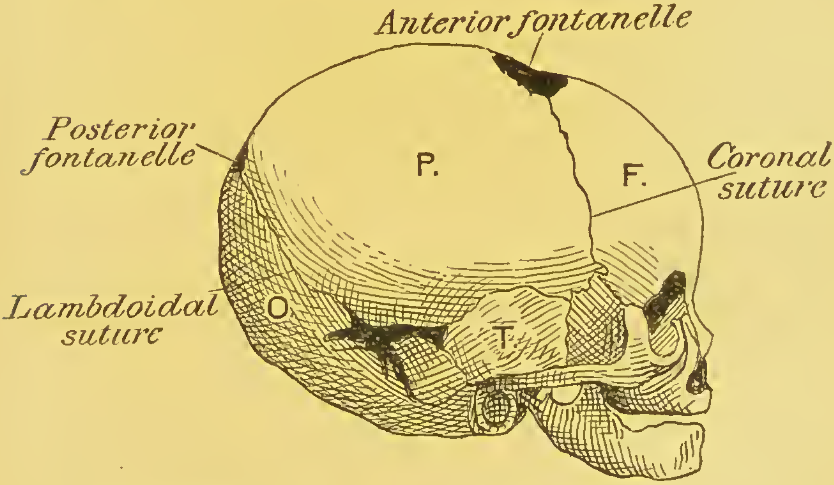

Fig. 4.—The skull of a new-born infant showing fontanelles, side view. O, occipital bone; P P, parietal bones; F F, frontal bones; T, temporal bone (after *Donald*).

the shafts of the bones. It is chiefly at the epiphyses that a bone increases in length. When, in rickets, the ends of the bone above the joint are swollen, it is the diseased epiphysis that causes this symptom. Violent injury may sometimes separate the epiphysis from the bone. Increase in stature chiefly depends upon the lengthening of the leg bones. After birth the legs grow more quickly than the arms.

The skull of the infant has special obstetric interest. At birth the bones lie edge to edge, but do not join; in fact, during birth the bones may slightly overlap at their edges. This facilitates birth, for a child with a rigid skull could hardly be born alive. At the top of the head of the new-born child a lozenge-shaped gap is left between the corners of four bones which meet there (see Fig. 3). This is called the *fontanelle.* Here the pulsations of the brain can be felt. In from eighteen months to two years this fontanelle will disappear, but in rickety children it may remain widely gaping long after it should be closed. The condition of the fontanelle should be noticed. It should not be unduly tense, nor throbbing with fever heat, and it should not be sunken in.

There is a smaller triangular fontanelle at the back of the head, and others at the temples, but these cease to be perceptible soon after birth.

THE NERVOUS SYSTEM.

The new-born child can breathe and cry, its heart beats, it can suck and swallow, the bowels and bladder can empty themselves, and the child can move the limbs and cling with the hands, but it can do little more than this, and its consciousness is almost a blank. We have to watch the acquirement of strength and of directed movement in the muscles, and of the power to sit, to stand, and walk; the development of the senses, the dawn of consciousness, the acquirement of articulate speech, and the establishment of relations in general with the world around; the growth of intellectual faculty and of the moral sense. The complete history of the individual from the time of earliest development to the day when he is able to dispense with parental help and earn his living in the world, forms a subject unsurpassed in importance by any that can be presented to the mind of man. The destiny of the race is bound up in the solution of the problems which this subject presents.

Inherited tendencies for good or for evil lie ready to reveal themselves, and many of the questions connected with them seem insoluble. Even if we had an exact detail of a man's ancestry, it does not follow that we could predict the character of the individual. We never know which ancestral traits will present themselves. No one has yet explained the difference seen between various children of the same parents brought up under apparently identical conditions. We know that when a physical peculiarity runs in a family, as, for instance, a sixth finger or toe, if one individual shows it, his grandfather may have had it, but not his parents; one or two cousins may have the extra digit, but none of his brothers or sisters. In like manner mental characteristics appear irregularly and unaccountably. A law there must be, but who can lay it down? A well-known writer suggests that every man is an omnibus carrying his ancestors inside.* To this one might add that there is no telling which ancestor will show himself next, or what feature he will present.

The development in childhood of the **functions of the brain** and nervous system, seems likely to attract more and more attention.

In these pages we can treat the question only very briefly, but for further information the reader may be referred to the works of Perez, Preyer, and others (see p. 23).

It has usually been considered that the *nervous system* in infancy and childhood is specially sensitive and irritable.

It is well known, for instance, that convulsions are more common in infancy than in adult age, and that they can be excited by slight causes, such as indigestion or the prick of a pin, or by a rise of temperature which in an adult would produce only a shiver. It is a fact also that children are specially liable to certain spasmodic diseases—*e.g.*, spasmodic croup. It seems likely, however, that this irritability of the nervous system is not developed in early infancy, but somewhat later, especially towards the time of teething; moreover, a very great tendency to spasm and convulsion is a sign of an unhealthy constitution, and is especially associated with rickets.

MOTOR FUNCTIONS.

Various classes of movement are performed by the body. First, there are automatic movements which need no consciousness to start them, and no teaching or practice to acquire them. Such are the beating of the heart and the movements of breathing. Closely allied to these are various reflex movements, in which muscular contraction is due to some distinct stimulus—*e.g.*, sneezing, hiccoughing, the last part of swallowing, the evacuation of the bowels and bladder.

---

* See *The Guardian Angel*, by O. W. Holmes.

Then there are certain instinctive movements, such as are seen so well in animals. For instance, the newly-fledged chicken will pick up a grain while the remnants of the egg shell are still sticking to its tail, while the young moorhen can swim as soon as it is born. In infants the power to suck is an example of instinct, chewing is another. The early movements of the limbs, and the crying of the new born are automatic, but later on, will power takes the control of these actions; and finally we see the highest motor function, namely, conscious voluntary movement, as, for instance, when the child pushes away the bottle which it will not have.

The movements of the limbs commence before birth; and, as soon as the child is born, more or less active movements of the limbs can be seen. At the end of two months these have considerable vigour, and the child evidently derives pleasure from executing them. The movements of the head are feeble at first. The child smiles first when the cheeks are touched, but this is chiefly reflex; but at the end of two months it may smile constantly when pleased. At the end of three months the motions of the hands are more distinct and better directed, and the infant can take hold of things and put them to its mouth. Soon after the third month the head can be raised, and at the fourth month the child may begin to have some power to retain the sitting posture. At six months it will usually be able to sit up and use playthings; at eight months it may be able to creep; at nine to ten months it is making efforts to stand; at eleven months it can often walk with assistance; at twelve months it can stand alone; and at fourteen or fifteen months walk alone. At this age it has much control over the hands, and turns the ear readily at every sound.

We may refer here to some observations on the **power of grip** in new-born infants.

As the result of observations made on upwards of sixty infants it was found by Dr. Louis Robinson that almost all could, within an hour of their birth, support the whole weight of their body for ten or more seconds by clinging to a finger or a stick, and that at the age of two or three weeks children could be got to hang by their hands for periods of one and a-half and two minutes or more. In one case the time was two minutes and thirty-five seconds. Dr. Robinson traces the origin of this to the days of our tree-inhabiting progenitors, when the survival of the offspring would depend on its power of clinging to its mother as she escaped from her enemies through the branches of the forest.* No animal is more helpless at birth than the human infant, but none has so great capacity for acquirement.

SENSORY FUNCTIONS.

Perez concludes that a child may know pleasure and pain before it is born. This is based upon the fact that the brain and nerves seem sufficiently developed for the purpose. Moreover, a child prematurely born at the seventh month can show so much evidence of sensation before it is two months old that one is led to consider whether it would have been devoid of all consciousness had it remained for two months longer within the womb.

At any rate, the ordinary sensation in the skin is present from birth.

SPECIAL SENSES.

Hearing.—Infants are said to be born deaf, but they soon show sensitiveness to loud shrill sounds, and may show distinct pleasure at musical sounds when one or two months old. At six months most babies like to be sung to. Children like to make noises, and delight in rattling and jingling sounds, as also in shrill whistles, which are torture to adults, whose ears are more sensitive. To the school-boy a new noise is a new joy, whether produced with pencil and slate, jew's harp, "popped" paper bag, comb and tissue paper, feet, fingers, or lips.

Taste.—Probably this sense is active almost from birth, the child deriving one of its earliest pleasures from the taste of its mother's milk. Certainly a hand-fed infant may early show relish or dislike for certain kinds of food.

Smell.—The power of smell is probably not very marked at first, and accurate discrimination of odour is a late acquirement. This is a point on which it is very difficult to obtain reliable information.

Sight.—The power of vision is a complicated acquirement. It involves not only the distinction between light and dark, but also the recognition of colour, the proper movements and coordination of the eyeballs, the focussing of the eye, and the correct judgment of form and distance, and, consequently, it takes a long time to learn to see.

---

* "Darwinism in the Nursery," by Louis Robinson, M.D. *Nineteenth Century Magazine*, November, 1891.

At first there is a diffused sense of light. The infant is soon attracted by anything luminous or bright, such as a candle, or a flashing pair of spectacles. For two months the eyes may not move together properly, so that there may be some squinting. Judgment of distance is at first obviously imperfect, and the child will try to grasp far-distant bright objects—the moon, for example. In six months it may begin to recognise people around it. Power of distinguishing colour is a comparatively late acquirement; red and yellow may be recognised in the first year of life, green and blue in the second or third. This is very interesting, because colour-perception seems to be one of mankind's latest visual acquirements, and some individuals remain permanently more or less colour-blind.

How do Children learn to Speak?—The first cries are instinctive, and are made with little or no consciousness. Presently the child finds that a cry brings relief to its wants, and it gradually learns to give a cry for this purpose. This is the beginning of its language. The quality of the cry will vary with the strength of the infant and the conformation of its vocal organs. Secondly, children learn to speak by imitation, and this is the main factor by which they come to talk the language of their parents. There is, however, another factor at work, namely, heredity. How far this acts, it is difficult to estimate; but it is pretty certain that a child has some untaught ability which helps it to speak. Gestures can be transmitted; the style of handwriting can be inherited, why not also some part of the speech-faculty? Children, then, begin to express themselves by attaching a meaning to noises and gestures which they have already been making involuntarily and unconsciously. They find out that these mean something, and can be used to express their wants and feelings. By the time they are twelve months old they will usually know the meaning of several words, and there will be one or more articulate sounds which they are commencing to use intelligently. Darwin's child when a year old tried to invent a word to designate his food and produced the word "mum," and henceforth that syllable signified "Give me something to eat." The first vowel sound learned is the open "ah," and the first consonants the labials "m," "p," and "b," &c. Hence "mama," "papa," and "baba" are often the first words spoken. After this the child quickly acquires a variety of words, and by the end of the second year he is beginning to use phrases. A child observed by the author had fifty expressions, intelligently used, at the end of eighteen months. But some healthy children are late in speaking, and may be several months behind the usual standard, and yet may ultimately speak with all correctness. Perez says that slowness in learning is not a bad sign, and that children may, like the celebrated parrot, "talk little, but think the more." At this stage meaningless reiteration of sounds is no sign of a weak brain.

The **development** of the **intellectual faculties** and of the **moral sense** is a study the interest and importance of which one can hardly over-estimate. The dawn of intellect is seen in the first voluntary and conscious movements, in the earliest recognition of objects and faces, and especially in conscious imitation of what others do, and in the development of speech. Before a child is a year old various emotions can be recognised, such as anger, fear, love, vanity, and jealousy; and strength of will-power can be clearly proved. The great importance of the subject centres in the problem of how far educational and disciplinary agencies can be brought to bear upon the infant in these early stages of development. Rudimentary the treatment must be, but early impressions are so persistent that everything points to the desirability of investigating the subject. It is plain that **regularity** of habit and **obedience** can be inculcated in the cradle. The infant can learn that he cannot have everything he cries for, and, as some early perception of **right** and **wrong** dawns in the child's mind, some effort can be made to lead him to choose between them from the first. Of late years this subject has begun to receive more of the attention that it merits, and, perhaps, the best thing the writer can do is to refer the interested reader to certain important works bearing on this question, as well as on the development of the intellect in infancy in general.

The first is Professor Preyer's work, *Die Seele des Kindes* (The mind of the child). This is translated by Mr. H. W. Brown, and published in two volumes in the *International Education Series.* To the second volume Mr. Brown has prefixed a valuable "conspectus" of Preyer's observations on the mind of the child up to the fortieth month of life. This will be of great service to the student. A second work is by Bernard Perez, *Les trois premières années de l'enfance* (The first three years of life), translated by A. M. Christie, with a valuable introduction by James Sully, M.A. (Sonnenschein & Co.). There is another work by the same author, *L'education dès le berceau* (Education from the cradle).

In the second volume of *Mind* (1877), Charles Darwin published an interesting account of the development of one of his own infants, and in the same volume, M. Taine gives an account of a child's acquirement of language.

To these we may add *Studies of Childhood*, by Prof. James Sully (Longman), a most interesting work; also *Mental Development in the Child and the Race*, by Professor Mark Baldwin. A concise and practical elementary outline of the mental development of the infant is given by Dr. Henry Ashby in his useful little manual called *Health in the Nursery* (Longman).*

Galton's "Life History Album."—We may take this opportunity of calling attention to a valuable publication. For the purpose of recording the history of individual lives from the cradle to the grave, the Collective Investigation Committee of the British Medical Association have issued, under the editorship of Mr. Francis Galton, F.R.S., a *Life History Album*. This is intended to be commenced by the parents and continued by the subject of the record on reaching mature years. The value of each record so taken is great, and when a large number of such albums are at the service of students of child-life and child-development, results of the highest interest and importance are likely to be obtained. The album contains directions for use, and shows the normal standards of growth and development throughout life. We strongly recommend the work to the reader's attention. It is published by Messrs. Macmillan & Co.

TEETHING.

The first set of teeth are called the **deciduous teeth,** because they are shed subsequently. They are also called the **milk teeth,** a term which conveys no precise meaning. The student may note the fact that the first set of teeth begin to appear in the sixth or seventh month, and the second set in the sixth or seventh year. The deciduous teeth are 20 in number, each half of each jaw containing 5—namely, 2 *incisors*, 1 *canine* tooth (also called the eye-tooth, from the erroneous notion that it has some intimate relation with the eye), and 2 *præmolars*. The diagram on p. 25 shows the shape and position of the deciduous teeth. It will be noticed that the lower central incisors are smaller than the upper (see Fig. 6), and that the upper præmolars have three fangs, whilst the lower have but two.

---

* A very complete and surprisingly extensive bibliography of *Child Psychology* will be found in Baldwin's *Dictionary of Philosophy and Psychology*, 1905, vol. iii., part 2., pp. 964-974.

The number of teeth is sometimes expressed by a formula, thus:—

$$\text{Incisors } \frac{2-2}{2-2}, \text{ canines } \frac{1-1}{1-1}, \text{ præmolars } \frac{2-2}{2-2}.$$

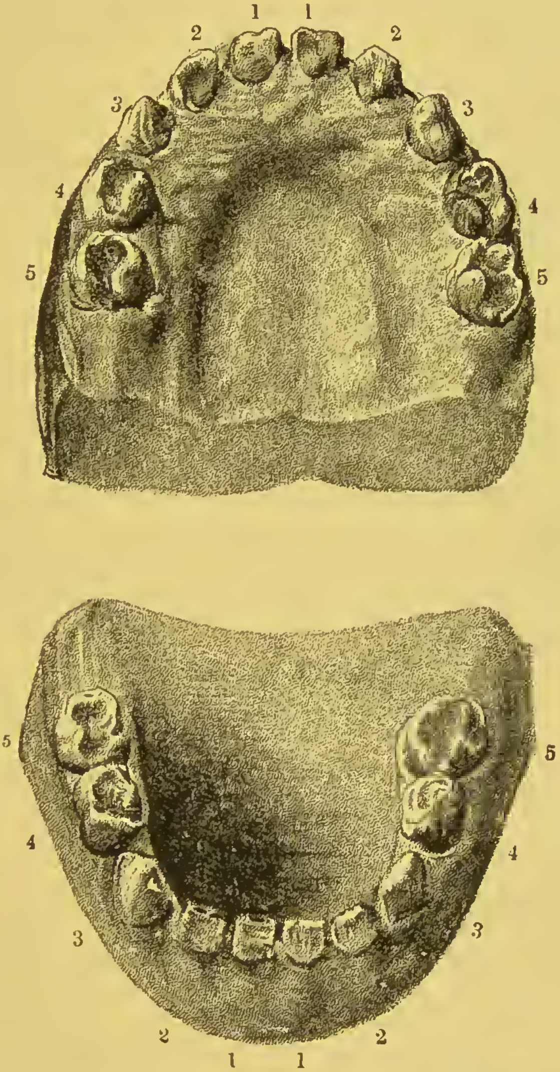

Fig. 5.—Diagram to show the deciduous teeth in both jaws, in position. 1, Central incisor; 2, lateral incisor; 3, canine tooth; 4, first præmolar; 5, second præmolar. (From a cast.)

The student will find such a formula useful in recording the number of teeth at any given age; for example, the following formula,

$$\text{I.}\ \frac{2-2}{2-2},\qquad \text{c.}\ \frac{0}{0},\qquad \text{p.m.}\ \frac{0-1}{0-0},$$

would express the fact that the child had all its incisor teeth, and one præmolar tooth on the left side of the upper jaw.

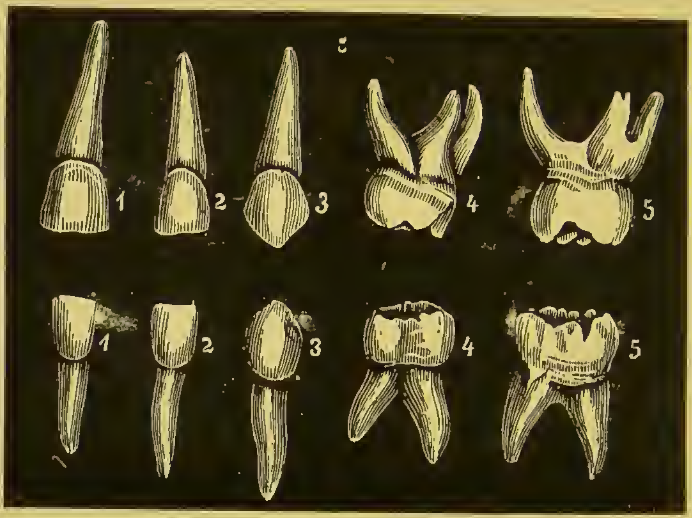

Fig. 6.—Diagram to show the individual teeth.
For references see Fig. 5.

The order in which the deciduous teeth appear is thus described in Tarnier's work:—

The milk teeth appear in groups, which are separated from each other by periods of rest.

First come the two lower incisors, usually in the seventh or eighth month, but sometimes as early as the fourth.

After an interval of six to eight weeks, the two upper central incisors appear, one eight to fifteen days after the other.

Somewhat later come the two upper lateral incisors, so that the infant has now four teeth above and two below.

About two months later—*i.e.*, at the commencement of the second year—the two lower lateral incisors, and the four first præmolars appear, their eruption being spread over about two months. Total, twelve teeth.

Two months more pass, and then, at about the middle of the second year, the four canine teeth take their place between the incisors and the molars.

After two months further interval—*i.e.*, towards the close of the second year—the four back teeth are cut, and the twenty deciduous teeth are complete.

The above may be taken as a general rule, to which there are various exceptions. There may be early eruption, and in rare cases an incisor may exist at birth. Again, the upper incisors may come before the lower, and even the lateral before the central. Supernumerary teeth may occasionally be found. The author has placed in the Pathological Museum, Leeds University, a cast taken from a case in which there were six well-formed incisors in the upper jaw. Finally, dentition may be much delayed. This is seen in weakly, and especially in rickety children.

GROWTH IN WEIGHT AND STATURE.

There can be no doubt that systematic careful weighing and measurement of infant affords valuable indication as to the healthiness or otherwise of their constitution, of their food and their surroundings. This is especially true of weighing.

We particularly recommend the method of *recording weight graphically on charts*, in the same way that clinical temperatures are recorded. The author has designed a weight-chart for making fifty-two weekly records in the year.* The advantage of such a record is very great, if regularly kept. The child should be weighed on a fixed day in each week, and at a fixed time. The time of the morning bath is recommended. The infant is wrapped in a piece of warm flannel of known weight, and placed in the scale pan. Salter's family balance answers well for the purpose, but special weighing machines for infants are on the market, such as Hawksley's. It is a good thing if weekly records are kept till the end of teething; after that records may be taken at least monthly.

As an illustration of the value of such records, we give the following chart taken from observations made by Professor Bowditch, of the Harvard University, and given in Galton's *Life History Album*. The record extends over the greater part of a year in the life of a little girl. The chart shows a loss of weight corresponding to a period of impaired nutrition and glandular enlargements, and a regaining of weight under treatment. It also shows how the weight declined when measles was incubating, and how the outbreak of this disease was thus heralded by a fall in the weight-curve. In a similar way the occurrence of thrush produces a distinct depression in the weight curve, and so will any feverish attack. Such records are of special value in schools and families, for they are often of use in drawing attention to the morbid influence of some factor in the condition of health, of which the early recognition is of the greatest importance.

---

* They can be obtained from Messrs. Reynolds & Branson, Ltd., of Leeds.

Standard of Increase in Weight.—It cannot be said that such a standard is finally established. The results obtained by different observers vary greatly, and this is due to the great variation that actually exists between different infants under different circumstances. Growth in weight varies with sex, with the initial weight of the child at birth, with the kind of feeding employed, with the healthiness of the surroundings, with nationality, and with other circumstances.

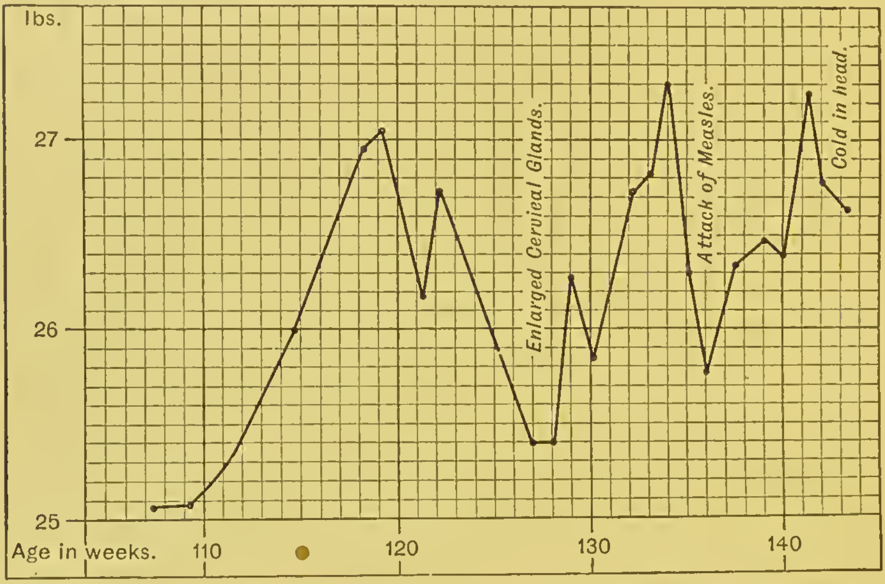

Fig. 7.—Curve of weekly weighings in a child in third year of life. (Given in Galton's *Life History Album.*)

We will now give some tables from various authorities. Fig. 8 shows in a graphic form the variation of weight observed in one particular infant in the first ten days of life. This is taken from Tarnier, and illustrates the fact that the infant loses weight for the first three days, but regains its birth-weight at the end of the first week. The average loss is from 150 to 200 grammes or $5\frac{1}{4}$ to 7 ounces.*

---

* Grammes may be converted into pounds by multiplying by 0·0022, and into ounces by multiplying by 0·0352.

Fig. 9 shows in pounds and ounces the average growth in weight in the first year.

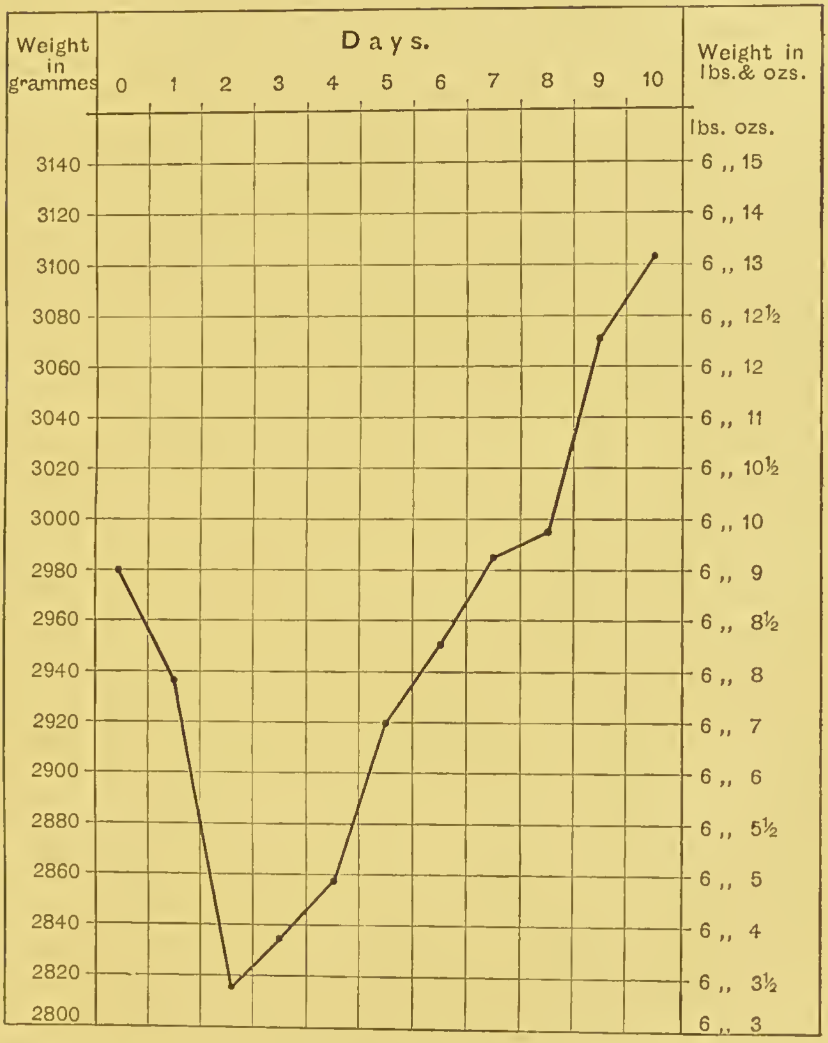

Fig. 8.—Chart to show variation in the weight of an infant in the first ten days of life.

This figure is constructed from the following table, which has been converted from grammes to pounds and ounces :—

TABLE TO SHOW WEIGHT AT THE END OF EACH MONTH IN POUNDS AND OUNCES.

No.	Bowditch and Fleischmann.		Albrecht.		Biedert.		Mean.	
	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.	lbs.	ozs.
1	9	5	9	0	8	14	9	1
2	11	7	10	15	11	7	11	4
3	13	4	12	13	13	7	13	3
4	14	12	14	6	15	0	14	11
5	15	15	15	12	16	1	15	15
6	16	15	16	15	16	13	16	14
7	17	12	17	14	17	8	17	11
8	18	6	18	9	18	6	18	7
9	19	1	19	5	19	3	19	3
10	19	11	19	14	19	8	19	11
11	20	3	20	7	19	13	20	2
12	20	9	20	14	20	2	20	8

The table assumes a weight at birth of 3,250 grammes, or 7·15 pounds.

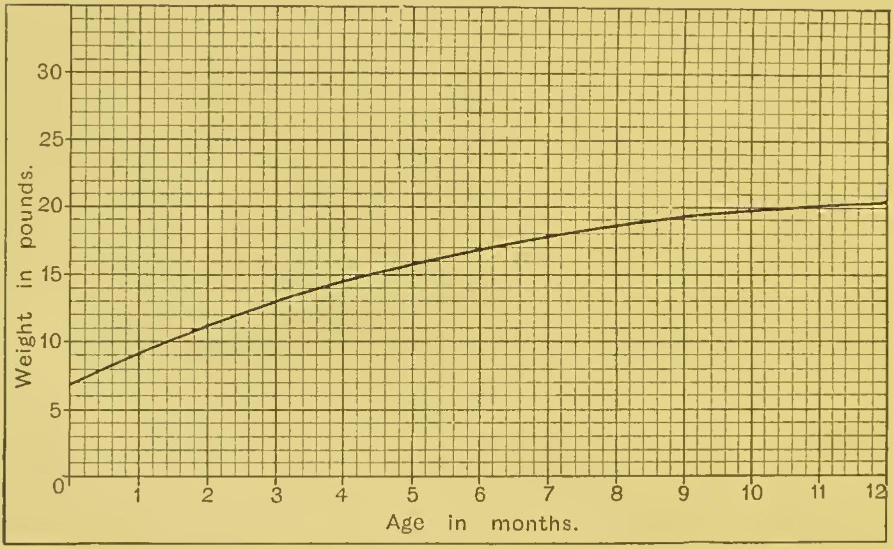

Fig. 9.—Graphic record showing the curve of weight in the first year of life.*

It will be seen that the increase is much the most rapid at first. A child doubles its weight at the end of the fifth month, and trebles it by the end of the first year. But hand-fed babies do not treble their weight (says Russow) till the second year. During the second year the gain is about 5 pounds, and for the next six years about 4 pounds a year.

---

* The author is indebted to his friend, Prof. J. H. Goodman, for converting these tables, and drawing the weight-curve.

Growth in Stature.—The following Table is from Quetelet:—

Length at birth, ...		19·50 ins.
Growth in the course of the first month,	40 millimetres,	1·57 ,,
,, ,, second ,,	30 ,,	1·18 ,,
,, ,, third ,,	20 ,,	0·78 ,,
,, each following month,	10 to 15 ,,	0·4 to 0·6 in.
Total increase, first year, . .	198 ,,	about 8 ins.
,, second year, . .	90 ,,	3·5 ,,
,, third year, . .	73 ,,	2·87 ,,
Each of two following years, . .	64 ,,	about 2·5 ,,

From this the following Table is deduced:—

Length at birth, ...	19·5 to 20 ins.
,, at end of first month, . . .	about 20·5 ,,
,, ,, second ,, . . .	,, 21 ,,
,, ,, third ,, . . .	,, 22 ,,
,, ,, fourth ,, . . .	,, 23 ,,
,, ,, fifth ,, . . .	,, 23·5 ,,
,, ,, sixth ,, . . .	,, 24 ,,
,, ,, seventh ,, . . .	,, 24·5 ,,
,, ,, eighth ,, . . .	,, 25 ,,
,, ,, ninth ,, . . .	,, 25·5 ,,
,, ,, tenth ,, . . .	,, 26 ,,
,, ,, eleventh ,, . . .	,, 26·5 ,,
,, ,, twelfth ,, . . .	,, 27 ,,
,, ,, two years, . . .	,, 30·5 ,,
,, ,, three ,, ...	,, 33 ,,
,, ,, four ,, ...	,, 35·5 ,,
,, ,, five ,, ...	,, 38 ,,

TWO-YEARS' DEVELOPMENT UNDER NORMAL CONDITIONS.

At the end of two years, then, the child should weigh 26 pounds, and measure 30 to 32 inches.

It should have twenty teeth. The fontanelles should be closed.

The child should be able to walk alone, the limbs being straight, the spine erect, and the chest well formed. No beads should be present on the ribs, nor should any epiphyses be enlarged.

The heart-sounds should be healthy, the lungs should expand well, and there should be no wheezing or other abnormal sound in the chest.

The flesh should be firm, and the face healthy in colour. There should be no history of serious or continued diarrhœa or vomiting, no excessive sweating from the head, no tendency to bronchitis, croup, or convulsions, no undue protuberance of the abdomen, and no enlargement of the spleen.

The bowels should act regularly once or twice daily, the motions being pretty well formed, brownish in colour, and with a fæcal odour.

The child should have a good appetite for its food, should sleep well, and manifest great enjoyment of physical exercise.

It should be bright and lively, and be able to say several single words, and even a few phrases.

The period of infancy may be said to end with the completion of the first dentition.

CHAPTER II.

DIFFICULTIES AND PROBLEMS OF INFANT-REARING—INFANT MORTALITY.

In the last chapter we sketched the normal development of an infant for two years, but when we come to inquire what proportion of new-born children are likely to attain this development and to survive this period, we are met with a series of facts which prove that in Great Britain and Ireland to-day there is an appalling infant mortality and an enormous sacrifice of child life.

One quarter of the total deaths in England and Wales occur in infants under twelve months, and about half of these take place in the first three months of life. During the last quarter of a century the general death-rate of the country has fallen considerably, but **the infant mortality has not materially decreased.** Moreover, the same causes which are producing this loss of life are leaving their mark on very many of the survivors in stunted development, weakness and disease.

That important document, the *Report of the Inter-Departmental Committee on Physical Deterioration*, published in 1904, has placed before the nation facts which were indeed already known to many, but which have appealed to the conscience of the nation at large in an unprecedented manner. Frequent reference will be made to this "Blue Book"* in these pages, but everyone who wishes to grasp the subject should make a first-hand study of its contents.

The best way to begin our examination of the subject is to ascertain from the reports of the Registrar-General where the mortality chiefly occurs, and the registered causes of the deaths.

STATISTICS OF INFANT MORTALITY.

The *Report of the Registrar-General for* 1891 contained some tables, which were the first of the kind ever prepared, and which we reproduce here because of the light which they throw on the subject. They give a comparison of the rates of infant mortality in three rural districts, and in five manufacturing and mining districts; and also in three manufacturing towns which have enjoyed an unenviable notoriety for their infant mortality.

---

* *Report of the Inter-Departmental Committee on Physical Deterioration*, 1904. Vol. i., Report and Appendix, price 1s. 2d. Vol. ii., Minutes of Evidence, price 4s. 1d.

TABLE FROM REGISTRAR-GENERAL'S REPORT, 1891, p. 40.

	Of 100,000 Persons, the Numbers Surviving at each Age.			Annual Death-rates per 1,000 Living in each Successive Interval of Age.		
Age.	Three Rural Counties—viz., Hertfordshire, Wiltshire, Dorsetshire.	Five Mining and Manufacturing Counties—viz., Staffordshire, Leicester, Lancashire, Yorks. (W.R.), Durham.	Preston, Leicester, Blackburn.	Three Rural Counties.	Five Mining and Manufacturing Counties.	Preston, Leicester, Blackburn.
At birth,	100,000	100,000	100,000	213	331	382
3 months,	94,820	92,051	90,874	75	154	240
6 ,,	93,068	88,574	85,574	61	128	180
12 ,,	90,283	83,081	78,197	...	...	...

These tables were published sixteen years ago, yet the facts which they indicate remain without material alteration; but to bring our information up to date, we will refer to the last Annual Report.*

The infant mortality for 1905 was the lowest on record, but this lowness is chiefly due to diminution in the third quarter of the year, owing to moderate temperature and copious rainfall, which lessen the number of deaths from summer diarrhœa. The rate was 128 per thousand for infants under one year. Examples may be quoted to show the variations noticed between different towns:—*Low infant mortality*—Guildford 65, Hornsea 66, Bromley 67, Aldershot 78. *High infant mortality*—Rhonda 200, Hyde 201, Ince-in-Makerfield 203, Burslem 205, Farnworth 228. Thus, these six show one child dying in the first year for every five born!

Another table in the same report shows that infant mortality in the first year of life, averaged for the ten years 1895 to 1904, was for England and Wales 150, and for London 155. As

---

* *Sixty-eighth Annual Report of the Registrar-General of Births, Deaths, and Marriages in England and Wales (1905)*, published 1907.

ANNUAL DEATHS, WITH AGES AND CAUSES, AMONG 100,000 INFANTS BORN ALIVE IN HERTFORDSHIRE, WILTSHIRE, AND DORSETSHIRE, 1889-91. (*Report of Registrar-General*, 1891, p. xiv.)

CAUSES OF DEATH.	AGES BY WEEKS.				AGES BY MONTHS.												TOTAL.
	1st.	2nd.	3rd.	4th.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	
Premature Birth,	1020	100	85	54	1267	54	19	17	10	2	2	2	2	2	2	2	1381
Atelectasis,	39	4	2	...	45	4	...	...	...	4	...	2	...	...	...	...	55
Congenital Malformations,	107	27	17	6	157	24	13	6	6	...	4	4	6	4	..	4	228
Whooping-Cough,	...	...	6	11	17	39	44	52	24	28	33	30	37	30	43	39	416
Measles,	...	...	...	...	...	...	...	4	2	7	7	22	39	28	24	43	176
Scarlet Fever,	...	...	...	...	...	...	...	...	2	...	...	...	2	...	...	2	6
Diarrhœal Diseases,	4	4	19	9	39	63	53	59	67	41	35	24	26	20	26	28	481
Enteritis,	6	2	11	2	21	11	11	7	14	11	6	9	13	6	6	7	122
Erysipelas,	...	...	7	2	9	6	6	2	2	2	2	...	...	...	...	2	31
Syphilis,	2	4	...	4	10	9	7	15	2	2	...	2	2	...	...	4	53
Liver Disease,	17	24	15	7	63	6	...	4	...	2	4	...	...	...	...	...	79
Dentition,	...	...	...	...	...	...	2	7	6	9	31	28	17	30	37	20	187
Other Diseases of Digestive Organs,	13	9	19	6	48	26	19	22	17	17	9	7	4	9	4	7	189
Convulsions and Diseases of Nervous System,	233	106	48	48	444	182	122	111	107	70	56	78	50	65	44	52	1381
Tubercular Meningitis,	...	...	2	2	4	2	6	9	9	9	19	2	19	28	11	20	138
Tabes Mesenterica,	...	2	2	...	4	19	22	28	22	20	20	13	15	17	19	17	216
Other Tubercular Diseases,	...	...	4	4	8	6	2	9	9	6	20	9	20	9	7	13	118
Atrophy,	579	101	160	108	968	220	141	89	96	50	46	41	24	26	22	15	1738
Diseases of Respiratory Organs,	22	46	39	44	168	247	170	188	185	145	163	184	154	181	182	138	2105
Injury at Birth,	7	2	...	...	9	...	...	...	...	...	...	...	...	...	...	...	9
Navel Hæmorrhage,	...	9	2	2	13	...	...	...	...	...	...	...	...	...	...	...	13
Suffocation,	14	8	2	10	34	15	24	10	12	6	4	2	4	...	2	...	113
Other violence,	33	3	2	...	38	...	...	3	...	2	5	...	...	2	2	2	54
All other causes,	67	22	20	13	122	52	46	31	26	28	17	24	20	19	24	19	428
ALL CAUSES,	2163	473	462	332	3488	985	707	673	618	461	483	483	454	476	455	434	9717

Annual Deaths, with Ages and Causes, among 100,000 Infants born alive in Preston, Leicester, and Blackburn, 1889-91. (*Report of Registrar-General*, 1891, p. xv.)

Causes of Death.	Ages by Weeks.				Ages by Months.												Total.
	1st.	2nd.	3rd.	4th.	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.	10th.	11th.	12th.	
Premature Birth,	1508	247	161	130	2054	158	25	19	8	6	6	...	...	...	...	3	2279
Atelectasis,	105	19	6	11	141	8	...	...	...	...	...	...	...	...	...	...	149
Congenital Malformations,	78	48	36	11	175	20	14	8	8	3	3	...	3	...	...	...	234
Whooping-Cough,	...	...	6	6	12	49	33	61	39	69	86	53	88	61	69	74	694
Measles,	...	...	...	...	...	14	6	11	19	19	33	50	111	133	130	100	626
Scarlet Fever,	...	...	...	...	...	...	...	...	3	...	3	8	...	8	6	3	31
Diarrhœal Diseases,	3	33	94	53	189	392	610	530	477	408	352	274	258	180	161	130	3961
Enteritis,	...	3	6	8	22	58	72	61	47	36	58	30	44	25	11	33	497
Erysipelas,	...	6	17	...	23	3	...	8	...	3	...	3	3	...	...	...	43
Syphilis,	3	3	14	3	23	39	44	25	19	11	6	6	8	6	3	...	190
Liver Disease,	11	19	19	3	52	16	6	6	6	...	...	...	3	...	...	...	89
Dentition,	...	...	...	...	...	...	...	8	25	53	39	53	50	80	80	36	424
Other Diseases of Digestive Organs,	17	11	14	14	56	25	30	28	44	28	11	22	14	14	6	6	284
Convulsions and Diseases of Nervous System,	435	156	165	136	901	380	391	391	302	308	289	186	200	176	130	122	3776
Tubercular Meningitis,	3	...	...	3	6	6	28	39	28	44	33	42	42	39	47	25	379
Tabes Mesenterica,	3	...	3	...	6	33	55	73	64	50	53	58	33	55	44	53	577
Other Tubercular Diseases,	...	3	...	...	3	17	33	25	25	39	22	11	25	19	25	17	261
Atrophy,	360	139	174	182	862	415	330	319	225	125	105	89	91	67	64	42	2734
Diseases of Respiratory Organs,	25	42	72	50	189	362	288	277	333	305	323	319	327	318	314	346	3701
Injury at Birth,	3	...	...	...	3	...	...	...	...	...	...	...	...	...	...	...	3
Navel Hæmorrhage,	...	5	3	3	11	3	...	...	...	...	...	...	...	...	...	...	14
Suffocation,	17	3	14	3	42	53	39	33	25	25	6	3	...	6	...	...	232
Other violence,	8	2	...	...	11	5	3	3	2	2	3	5	...	...	6	11	51
All other causes,	67	34	28	30	166	74	42	42	50	50	44	14	17	33	14	28	574
All Causes,	2646	773	832	646	4947	2130	2049	1967	1749	1584	1475	1226	1317	1220	1110	1029	21,803

examples of extremes, take the following:—*Under 100*—Wiltshire 98, Dorset 99, Westmoreland 99. *Above 160*—West Riding of Yorkshire 161, Glamorganshire 161, Northumberland 162, Notts 164, East Riding of Yorkshire 165, Staffordshire 166, Durham 166, Warwickshire 168, Caermarthenshire 170, Lancashire 176.

To put it briefly, for the last ten years one child in every 6·6 born in England and Wales died in the first year of life. In the most healthy parts of the country the mortality has been one in ten; in the least healthy places it has been as much as one in five. In 1905 the average mortality was one in eight.

As we study these figures, we are reminded of the saying that

> "God made the country, and man made the town." *

If we next inquire what are the particular causes of the deaths above recorded, we find an answer in the tables on pp. 35 and 36, which are based on the observations of the three years 1889-91.

These show several points. Alike in town and country, the principal cause of death in the first week of life is premature birth, or some malformation, lung defect, or other cause which involves unfitness to live, and which leads to "Atrophy." More than four-fifths of the deaths in the first month are returned under these headings.

But, except in case of such birth-defects, the mortality is much in excess in towns.

We select from the tables on pp. 35 and 36 the following conditions, which are very largely due to causes connected with bad food, and add together the mortality assigned to them:—

	Three Rural Counties.	Three Worst Towns.
Diarrhœal diseases, ...	481	3,961
Enteritis, ...	122	497
Other diseases of the digestive organs, .	189	284
Tabes mesenterica, ...	216	577
	1,008	5,319

---

* Cowper, *The Task*. One might here quote, as still more appropriate, Cowley's line—

> "God the first garden made, and the first city, Cain."

Here we see an enormous excess in urban mortality. Some of the cases called "atrophy" and "dentition" probably belong to this group.* The deaths from "suffocation" are chiefly due to the smothering of children by overlying in the night; overlying chiefly occurs on Saturday night, a painfully suggestive fact. It is more common in town than country.

Syphilis is three and three-fifths times more common in the towns.

The comparative immunity of infants from epidemic disease is well seen from this report, but this fact only adds significance to the heaviness of the mortality.

The term *rickets* does not occur in the above tables, but we know that it is a predisposing cause in a large proportion of the diseases mentioned. It is a factor in disease of the respiratory and digestive organs. It is a potent cause of fatal convulsions, and of "nervous diseases," and of diseases of "dentition," from all of which the greater mortality in towns is marked.

Of the high rate of infant mortality which the Registrar-General records in manufacturing towns, concrete instances could be furnished indefinitely by those of us who are familiar with the medical histories of the women who attend our hospitals. It is quite common to meet with mothers who have borne eight to twelve children, of whom only three or four reached their teens. An instance is given in the Physical Deterioration Report of one who had lost 17 out of 18 children, and of another who had borne 20 children, of whom 16 died in the first year of life (*Report*, vol. i., pp. 44, 45).

That high infant mortality is not peculiar to England, but that it is, on the contrary, a world-wide problem is shown by a table of international statistics which is found in the 1905 Report.

Deaths of children under one year of age per thousand births in the years 1895-1904 (or in a period nearly corresponding):—Chili 326, Russia in Europe 268, Austria 224, Roumania 218, Hungary 216, Prussia 197, Spain 182, Jamaica 176, Italy 170, Ceylon 169, Belgium 156, France 153, Servia 154, Japan 151, England and Wales 150, Netherlands 147, Western Australia 147, Bulgaria 144, Switzerland 142, Finland 134, Denmark 127, Scotland 126, New South Wales 108, Victoria 105, Ireland 103,

---

* It must be understood that these tables do not contain a *scientific classification* of disease. They are a list of causes of death certified by some 35,000 different medical men, and the different terms have a variable meaning. The term "atrophy," for example, may denote almost anything, and "convulsions" have a very wide causation.

South Australia 102, Queensland 101, Sweden 98, Tasmania 94, Norway 90, New Zealand 79.

It will appear later that in our study of the means of dealing with this mortality, very much may be learned by us from the methods that are being adopted in other countries.

CAUSES OF INFANT MORTALITY.

We will now examine in detail the causes of infant mortality, and as we do so, we shall find the reasons why it is so high in our manufacturing centres and our great cities.

Premature Birth, Congenital Weakness and Defect account for great loss of life, the children dying because they have not vitality enough to live outside the womb. If we seek the causes of such prematurity, we find that it is mostly to be explained by the fact that, during pregnancy, the mothers are in ill-health, or are overworked and underfed, and living amidst bad sanitary surroundings. In manufacturing centres the women often work in the mills during the whole of their pregnancies, ceasing only with the onset of labour. That the effect of this on the children born is bad is well known, but we may refer specially to some observations published by Pinard, which demonstrate that hard work continued through pregnancy tends to shorten the period of pregnancy, and thus to lead to the premature birth of infants, who are of low weight and feeble vitality; whereas, on the other hand, rest during pregnancy, and especially during the later months, helps to prevent too early delivery, and leads to the production of heavier and stronger children.*

Closely allied to this question is that of **Still-births.** How many pregnancies terminate in the birth of dead infants cannot be stated, because **there has been in England up to now no registration of still-births.** Thus, there is an enormous loss of life at or before birth which has gone unrecorded, but which might very largely be prevented by proper care and treatment of women in pregnancy and labour. And, in addition to all this, there is further loss by the termination of a very large proportion of pregnancies in abortion or miscarriage, probably about 20 per cent.† In future still-births will be notified (see p. 63).

Amongst maternal diseases which act deleteriously upon the unborn child, special stress must be laid on **Syphilitic Infection,** which is a potent destroyer of fœtal life, a cause of miscarriage and premature delivery, and of congenital disease in children born alive.*

---

* See Newman, *Infant Mortality*, pp. 78, *et seq.*

† See an address by Dr. Malins, *Trans. Obstetrical Socy. of London*, 1903.

In the Physical Deterioration Report, **Alcoholism** in women is stated to be a very important cause of infant mortality and ill-development, and of increased vulnerability to disease. Intemperate mothers not only bear weak infants, but they give them insufficient care and ill-treatment subsequently; and when the father drinks as well, the consequences are doubly serious. Observations upon the offspring of chronic female drunkards in Liverpool prisons, showed that the death-rate amongst the infants of inebriate mothers was nearly 2½ times that amongst sober mothers of the same stock, and that in the alcoholic family there was a decrease of vitality in successive children (*P. D. Report*, vol. i., p. 32). Dr. Cunningham says that syphilis and alcohol transmit their ill effects to the third and fourth generation.

Intemperance amongst women is considered to be on the increase. A remarkable pamphlet, called *The Cry of the Children*, lately published by Mr. G. R. Sims, gives most graphic and painful pictures of the prevalence of drinking amongst women in London, who crowd the public-houses to the latest evening hours, actually pouring liquor into the mouths of their infants. This is by no means confined to London. A demand for legislative measures is now being urged by a large body of medical men, statesmen, and others, chiefly in consequence of this publication, and the confirmatory evidence which has been adduced.

Thus debility of constitution and blood diseases acquired by parents can be transmitted to children, who consequently come into the world with a congenital unfitness for living. There are diseases from which the unborn child may suffer in the womb. It is important to state, however, that acquired injuries and mutilations are not transmitted from parent to child. A father who has lost a leg or an eye will produce children with normal limbs and features. A mother's face may be seared with the pits of a past attack of smallpox, but her infant's skin will be free from such blemish. So, after centuries of foot-binding in China, the Chinese infant is born with feet as perfect as those of any other child. If this were not so, and if all the

---

* There are other phases of the subject of the loss of embryonic and fœtal life which we cannot discuss here, but we refer the student to a valuable address on "The Unborn Child: Its Care and its Rights," by Dr. T. A. Helme, *British Med. Journal*, 1907, vol. ii., p. 421.

SCHOOL OF MEDICINE.
UNIVERSITY OF LEEDS.

damages done to our ancestors left traces in their descendants, the battered, maimed, and mutilated state of men's bodies would lead to the rapid extinction of the race.

One cannot but be struck with the fact that weak and puny, and even diseased, mothers so often bear very healthy and well-developed children; the infant seems to thrive in the womb at the mother's expense, and it is said that from 80 to 85 per cent. of infants are born fit to survive.

In this there is hope, for it affords expectation that, if the causes of mortality and feeble development of infants, as described in this chapter, can be lessened or removed, recovery of the race and return to a healthier type will result (*P. D. Report*, vol. i., p. 146).

Some have contended that to lessen infant mortality would mean that we should be keeping alive those who are physically unfit, and that so the race would be weakened by checking a natural process of weeding and pruning. But such is not the case if from 80 to 85 per cent. are fit to survive. Our aim is to prevent these from being killed, or from being crippled and enfeebled.

But, in any case, the healing art recognises nothing contrary to the principle that **all life must be cherished, and the weakest cherished most carefully.** Thus the weak may become strong, and the strong more vigorous still.*

The employment of mothers in factories also leads to too early a return to work after childbirth, which sometimes occurs in an incredibly short time. This damages their health, and interferes with suckling and with the due care of the children, for these are often left to be tended by neighbours or by other children. Under these circumstances, improper artificial feeding is the almost inevitable consequence.

Early and improvident marriage is responsible for much of this. The parents marry without adequate means, their furniture being obtained on the hire system. To meet the expenses of the confinement and the infant's maintenance, the mother is obliged to go out to work, and the mill or factory offers the best opportunity. On the other hand, some mothers prefer factory to home life, for they find it more exciting, and their children are neglected in consequence.†

---

* There is a popular notion that a seriously deformed or monstrous child may be smothered or otherwise destroyed. We need hardly say that any-one privy to such an act would be guilty—probably of murder, certainly of manslaughter.

† See paper by Dr. G. Reid, *Report of National Conference on Infant Mortality*, 1906, p. 223. Published by P. S. King & Son.

Illegitimate children have, for similar reasons, a very high mortality, which is (says the *P. D. Report*, p. 44) "enormously greater than among children born in wedlock."

Parental ignorance and neglect are specially mentioned by the *Physical Deterioration Report* as a cause of infant mortality, and rightly so.

To rear a healthy child, three things at least are needed. First, means to provide the requisite healthy environment, and to buy the proper food; second, knowledge or sound instruction and advice as to the right way to care for the child; third, unceasing vigilance, patience, and unselfish devotion. If these be wanting, success will not be attained. Whilst among the very poor domestic virtues often find striking illustration, on the other hand, the prevalence of indifference and carelessness, amounting to positive inhumanity and cruelty, is borne witness to by many competent observers.

Infants are killed by being overlain by their mothers when sleeping by their side. Such cases are commonly due to drunkenness, and they occur chiefly between Friday night and Monday morning. Accidents from fire occurring to children left alone are very common. Complete and almost incredible ignorance of the hygiene of infancy and childhood is very widely diffused. Chronic sleeplessness in children owing to the habits of the mothers is another example of such mismanagement (*P. D. Report*, 287).

Neglect to recognise the ailments of children and to seek treatment at an early stage is another cause to be mentioned. The administering of "soothing syrups" and other drugs is responsible for many deaths.

Many similar illustrations could be adduced.

The amount of money spent on alcoholic drinks by men and women often renders the proper feeding of mother and infant impossible amongst the poorer classes. Messrs. Rowntree and Sherwell tell us that the average expenditure on drink amongst working-class families is over six shillings per week per family. That, in intemperate households, the children can be properly fed and cared for is impossible.*

THE OVERCROWDING OF URBAN AREAS is a problem acutely felt to-day, and one of its most important results is seen in the effect on the health and development of the children born therein. As items in the insanitary environment which is found, we may mention the following:—

---

* *The Temperance Problem and Social Reform*, Rowntree & Sherwell, Chap. i.

Want of Sufficient Fresh Air.—This is attributable to undue density of the population on a given area—to overcrowding within dwelling-houses—to the construction of blind courts and alleys, of back-to-back houses, and of narrow streets between high walls and high buildings—to the absence of open spaces, and to distance from any park or rural district—to the non-ventilation of houses and the insufficient ventilation of work-rooms and factories—and to popular ignorance of the need for ventilation. To the inevitable stagnation and impurity of atmosphere so produced, we must add the direct fouling of the air by open sewers, "middens," bad drainage, accumulations of refuse and dirt, and by the products of offensive trades; and the degree of municipal sanitary neglect prevalent in the districts concerned must also be taken into account.

Want of Sunshine.—Sunshine is shut out by the conditions of city-building just described, and also by the clouds of *smoke* which overhang our manufacturing towns. This is no matter of mere conjecture. In the city of Leeds, observations with Jordan's sunshine recorder, conducted by the late Mr. Richard Reynolds and others, have very clearly demonstrated the extent to which sunshine is excluded from the heart of the city by the clouds of smoke which hang above it, which proceed from both factory and domestic chimneys. Children cannot thrive without sunshine; they need it as much as the flowers do. We know that sunshine can destroy disease germs, that it has an important part to play in healthy growth, and we are beginning to realise the disastrous consequences of shutting it out.

Insanitary Dwellings.—These may be ill-constructed, ill-ventilated, ill-drained, dark, and damp and dirty. They are liable to deficient water supply and scandalously inadequate sanitary arrangements. Dampness of house and soil is associated with the prevalence of rheumatism and of consumption. If the soil be damp and unhealthy in its composition, as, for instance, in the soil made by "tippings," the "jerry-built" house which stands upon it is all the more dangerous. So is the house which has fallen out of repair.

Poverty acts in a more deleterious way in towns than country. In the country, fresh air, open spaces, and sunshine cost nothing. In towns, the poor have to take the most insanitary quarters. Intemperance and immorality are more common in large towns. Good milk is not easily obtained in towns by the poor. Unfortunately, this difficulty is being increasingly felt by the poor in the country also, because it pays best to send the milk to the towns.

INSUFFICIENT AND IMPROPER FEEDING.

It is of extreme importance that it should be known that an exceedingly large proportion of the diseases of infancy are food diseases—that is, the children suffer and die because they are fed on food which is intrinsically unwholesome and harmful, or which is unsuitable for their age, or indigestible, or deficient in nutritive properties. And as milk is the staple food of infancy, it is largely a question of the consequences of feeding on poor or bad milk, or on ill-judged substitutes for milk.

Deleterious Consequences of Disusage of Suckling.—Any one who has experience of the children brought to our hospitals knows how often an infant's ailments date from the time of commencing artificial feeding, and to how great an extent the maladies of infancy predominate in frequency amongst hand-fed or bottle-fed children. The close connection between modes of feeding and infant mortality is shown by the fact that during the sufferings and starvation connected with the siege of Paris in 1870-71, whilst the general mortality was doubled, that of infants is said to have been reduced by about 40 per cent., owing to the mothers being obliged to suckle their own infants. The same increase in adult and diminution in infant mortality was seen during the Lancashire Cotton Famine, when the mothers were not at work in the mills.*

The reason of this is simple. Mother's milk is a perfect and sufficient food for the young infant. In the absence of mother's milk, to provide a perfect diet for an infant needs knowledge, great care, and pains, patience, and a certain amount of extra expense. When, instead of a diet of breast milk, the infant is fed on milk that is sour, on cow's milk not properly modified, on starchy food which it cannot possibly digest, on miscellaneous diet from the parents' table, or when some essential ingredient is absent from the diet, the diseases that will follow can be predicted with a great amount of certainty. Ignorance and carelessness will certainly produce such diseases in town or country, but the result is worse in towns because of other surrounding conditions. The folly of many mothers in regard to infant feeding is almost beyond belief, but it is quite a common thing to see an infant in arms fed with a little of whatever the parents may have on the table. We have known shrimps to be given to an infant a few days old, because the mother thought "it seemed to want it."

---

* *Vital Statistics*, by Dr. H. Newsholme.

The complete ignorance of many young girls who become mothers as to everything connected with the most serious responsibilities of their lives, is a serious defect in our national education.

"A decrease at the present time in breast feeding is generally admitted to be the case in all classes of society, at any rate in the urban districts. With the poor it seems fair to say that their failure in this respect is due rather to inability than to unwillingness, especially in view of the fact that, as long as it can be properly continued, breast feeding is much the most economical way of nourishing an infant. It is, no doubt, the case that women are often unwilling to nurse their own children, because it interferes with their going to work, and, in the absence of such excuse, mothers are often neglectful of their duty from sheer indifference or weariness" (*P. D. Report*, 264). In the better classes of society, many mothers are not willing to make the very considerable sacrifice of social engagements which suckling involves. "**Back to the breast**" is a cry raised by social reformers to-day.

The effects of sour milk are so serious that we must dwell in some detail upon this subject. All milk exposed to the air at ordinary temperature becomes in a little while sour and unfit for food, and this is only a question of time. The souring is due to the action of germs. Many species of micro-organisms have been described as being concerned in the lactic fermentation of milk. Such germs being always present in the dust of the air, fall into the exposed milk; a kind of fermentation is set up, and the milk sugar is changed into lactic acid, so that the milk becomes sour. This is not the only change that occurs, for other kinds of decomposition go on and cause rancidity in the milk. As milk sours it curdles. Nothing helps more to "turn" milk than putting it in vessels that are already fouled by sour milk. Every dairymaid knows the incessant cleansing, scalding, and scouring of pans that is necessary to prevent the ruin of her work. Similar care is of vital importance in the nursery. Unfortunately the common feeding bottle is a regular germ trap. The glass tube, the screw cap, the teat, and india-rubber tubing are especially liable to harbour germs, and even when the nurse considers that the bottle has been duly cleansed and that it is ready for use, it will often be found more or less foul; whilst among careless and dirty people the bottle often emits a rancid, sickening odour.*

Scrupulous care must be taken to prevent the infant from ever swallowing a drop of sour milk. Sour milk has been the cause of fatal illness in countless children. It sets up irritation, vomiting, and diarrhœa, and catarrh of the stomach and bowels, and causes thrush and other lesions. These conditions may be so severe that when the supply of milk is discontinued the functions of the digestive organs prove to be so disordered that all food is alike rejected and the child dies.

Lister's Discovery.—If fresh milk be boiled to kill any existing germs, and then be so sealed up that nothing can enter, it will remain free from fermentation, decomposition, and sourness. It was Lister who established this fact,† and his discovery was a momentous one, for the recognition of the fact that germs entering organic substances can change their composition and alter their properties, and that the exclusion of all germs can prevent such changes, is the principle which is the basis of the antiseptic method of treating wounds.

We shall show hereafter how this principle is applied to the sterilisation of milk (p. 68).

If, in the cowshed and dairy, proper precautions be not taken, the milk will be contaminated, not only by the stale and sour cans, but also by the dust and dirt which are inseparable from the animals and their surroundings. In addition to this the **germs of specific disease** may be carried by milk. Typhoid fever has been spread by contaminated water being added to the milk, and outbreaks of typhoid have followed the beats of individual milk dealers. Diarrhœa, dysentery, and cholera are disseminated in a similar way, especially in India, where insanitary practices prevail to an almost incredible degree. Scarlet fever also has been conveyed from a dairy or farm where the disease has been present amongst the residents. It seems clear also that the germs which cause **tuberculous disease**—*e.g.*, consumption of the lungs or bowels—may be conveyed by milk from a tuberculous cow, and tuberculous cows are common.

Milk is only too good a culture medium for germs, especially

---

* Of thirty-one feeding bottles examined by H. Fauvel, twenty-eight contained in the glass tube, or teat, a quantity of mycelium, numerous very active bacteria, and a few vibriones. Several bottles washed carefully and considered to be ready for use contained, nevertheless, a large quantity of microbes.

† Pathological Society's *Transactions*, 1878.

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

at temperatures approaching blood heat. When the temperature is reduced towards freezing point (32° F.), such changes in the milk are *very greatly retarded*, and thus milk can be preserved by refrigeration.

Soxhlet says that fresh milk turns sour and curdles as follows :—

At 32° C.	(90° F.)	in 19 hours.
25° C.	(77° F.)	in 29 ,,
17·5° C.	(63·5° F.)	in 63 ,,
10° C.	(40° F.)	in 208 ,,
0° C.	(32° F.)	in 3 weeks.

Fortunately the healthy human stomach is able, to a great extent, to resist the effects of germs which enter it, but there is a limit to this power. When the germs are many, when the milk has been for some time exposed to their action, when the child is young and delicate and its digestive powers feeble, then bad results are most liable to occur.

SPECIAL DISEASES OF INFANCY.

We shall now say a little about some of the particular diseases which the causes we have been considering may produce, because the prevention of these particular diseases has to be kept in mind in the care and feeding of infancy.

Gastro-enteric catarrh, or inflammation of the mucous membrane lining the stomach and bowels, has already been alluded to.

It may be caused by sour milk, or any kind of decomposing food, especially decomposing animal food. It may also be set up by the presence in the stomach and bowels of lumps of undigested milk-curd, or by the premature use of starchy food, which is very apt to ferment in the bowels; also, generally, by the use of any kind of food which the infant cannot digest; by the use of unhealthy water to dilute the milk; or by the presence of sewer gas in the air of the house. Chilling through insufficient clothing of thighs and abdomen helps to intensify the disease.

Climate and season affect the prevalence of the disease. It is, for example, more fatal in the United States than in England, the hot seasons especially bringing a serious infant mortality from this cause, but summer diarrhœa has to be reckoned with in England, and it is a formidable foe, especially in hot dry summers.

Its most prominent symptoms are vomiting, which may become so serious that nothing can be retained; diarrhœa, with offensive, slimy, or blood-stained motions; griping pains and flatulence; and the constitutional symptoms, and, especially, the rapid loss of flesh consequent on the foregoing. The different diarrhœal diseases are variously classified by authors, and vary in intensity from transient looseness of the bowels to dysenteric or choleraic diarrhœa. We must add that chronic gastro-enteric catarrh is a factor in the production of other diseases—*e.g.*, rickets, because of the chronic state of malnutrition which it maintains.

Disease of this class is far more prevalent and fatal in urban than rural districts; see the tables quoted above.

Thrush.—Sometimes within the first few days of life, if the tongue, the interior of the lips and cheeks, and the palate of the infant be examined, there may be found scattered over the mucous membrane patches whose appearance is compared to "hoar frost." The cause of this is the growth of a fungus upon the mucous membrane, and the effect of the condition is to cause irritation and heat in the mouth, pain on swallowing, and often some irritation of stomach and bowels, diarrhœa, and general feverishness. The conditions which give rise to the onset of the disease are the feebleness of infancy, the presence in the mouth of sour milk, the use of an imperfectly cleansed teat, and, generally, the neglect of cleanliness in feeding. The disease is not serious in an otherwise healthy child, but may be the starting point of a serious condition of stomach and bowels, when the child is also wrongly fed and ill cared for. Other forms of inflammation of the mucous membrane of the mouth may be associated with thrush. It is preventible, and the precautions to be taken will be described hereafter (p. 131).

Rickets.—One of the chief problems in infant-rearing is to prevent the development of rickets. This disease affects profoundly the whole system of the child, although its effects are most conspicuous in the bones. It is very important to recognise the earliest signs of the development of this disease, for it is eminently preventible and curable. The bones in rickets are too soft, being deficient in hard earthy matter. Either they fail to become hard, or they soften again after they have begun to harden, and consequently give way under the pressure of the weight of the body. The legs may thus become bowed, or knock-kneed, and the bones may be twisted as well as bent. The arms, too, may be bent, especially if the child crawl much on all-fours. The sides of the chest become flattened and depressed, or even concave. The fontanelle remains long unclosed, the forehead is broad with prominent forehead bones, and the top of the head is wide and flat. One sign of rickets—important because easily recognised—is the swellings at the end of the long bones, just

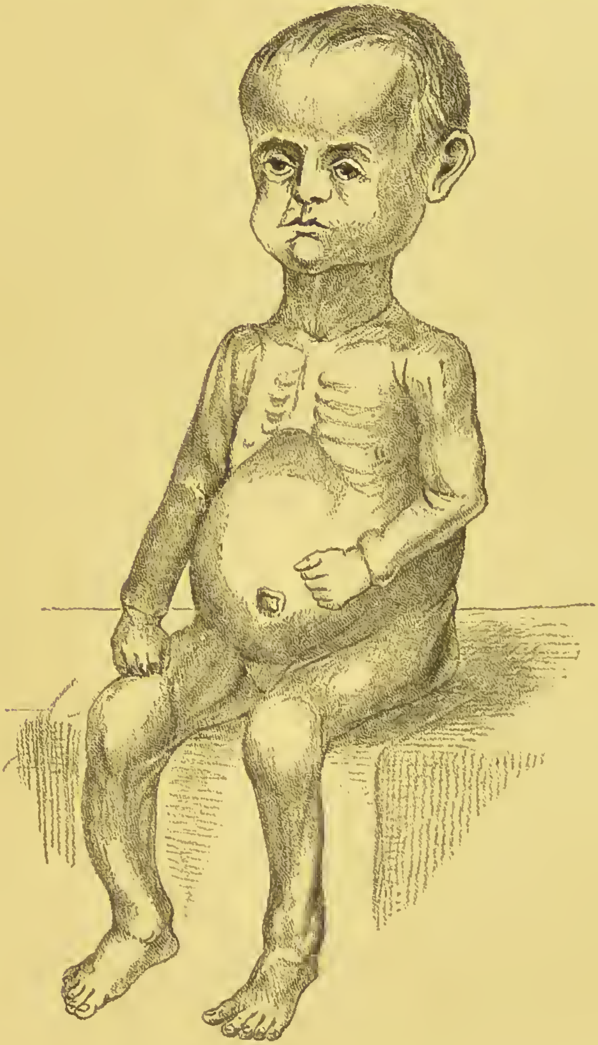

Fig. 10.—"Rickets" (from life).

above the joints. This is due to the enlargement of the epiphyses, and it produces the appearance shown in Fig. 10. It is easily perceived in the so-called rickety "rosary." If in a rickety child we run our fingers along each rib from the breast-bone outwards, a little swelling or "bead" is felt at the place where the rib joins the cartilage (Fig. 11), and this is a very good way of detecting the onset of the disease. The ligaments in a rickety child tend to yield. The spine is weak, and tends to form an abnormal curve in the back when the child sits up, which can, however, be readily straightened by the recumbent position. The abdomen is unduly prominent. This so-called "pot-belly" is due principally to flatulent distension, but the spleen and liver are sometimes enlarged. The children tend to become pale and anæmic. Teething begins late and progresses slowly, and the teeth decay early. The muscles are weak, and the children walk late. Sir William Jenner long ago pointed out three characteristic symptoms in rickety children. They sweat much from the head at night, causing a wet place on the pillow where the head has rested; they kick the clothes off at night to obtain coolness; and they dislike being jolted in the arms, which most babies enjoy. Rickety children are

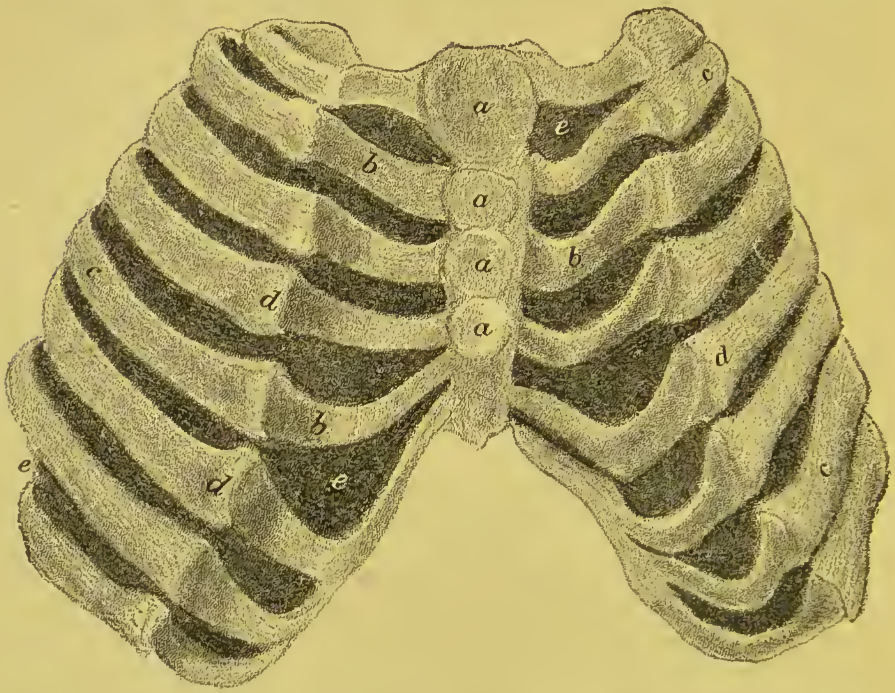

Fig. 11.—The "Rosary" of Rickets (from a specimen in the Pathological Museum of the Leeds University)—*a*, Breast bone; *b*, cartilages of ribs (somewhat shrunken post-mortem); *c*, ribs proper; *d*, beads at junction of rib and cartilage; *e*, intercostal muscles.

specially liable to bronchitis and other lung diseases, also to spasmodic croup; to gastro-enteric catarrh, diarrhœa, &c.; and to convulsions, especially during teething. Moreover, the ordinary ailments of infancy affect them with extra severity, and a large proportion of the deaths in infancy occur in rickety children, although the registered causes may be bronchitis, dentition, diarrhœa, convulsions, &c.

"Fat Rickets."—Children with rickets are not necessarily thin; some are over-fat. The "prize" babies exhibited in shows are frequently of this class.

What are the Causes of Rickets?—In describing the conditions of life amongst the labouring classes in great towns, we have portrayed the conditions amidst which this disease prevails most constantly, and reaches its worst phases. Given such environment, the streets will be full of bow-legged children, and the death-rate will be swelled by rickety diseases. It is largely a disease of great cities.

But when we try to state exactly which of these factors is the essential cause of the disease, opinions vary. Rickets is certainly very largely a food disease. It is chiefly found in those who have not been suckled at all, or who have been weaned prematurely. It is very commonly found in those who have suffered much from vomiting and diarrhœa, and in those who have been fed too early on starchy foods. It is found when good cow's milk cannot be obtained, or when the child, for some reason or other, cannot take it. Some have laid the chief stress on deficiency of fresh air, or deficiency of sunlight. Inherited constitutional debility also helps to produce rickets.

Bow-legged children may be seen on the mountain sides in Switzerland, in the very pastures from which milk is sent all over the world. This is because they themselves are not properly fed on it. Rickets is called on the Continent "The English Disease" (*Die Englische Krankheit*), but we have no peculiar inheritance therein.

Pale, anæmic, over-worked mothers, debilitated by frequent child-bearing, are apt to beget such children. Some authorities have maintained that the disease is hereditary. Syphilis helps to cause it, but can be regarded only as an occasional factor. Probably those are nearest to the truth who look upon most of the above as predisposing causes, but who find the essential cause in the deficiency of some element essential to the diet of children. It has been strongly urged that it is a deficiency of lime in the drinking water that is the fault. Unfortunately, this theory is not tenable; one can only wish that the matter were so simple that an adequate quantity of lime would prevent the disease; but rickets occurs in limestone districts, and in infants fed on foods rich in lime. Probably the defects which are most potent are deficiency of fatty material (especially cream) and of nitrogenous material. These elements are often seriously deficient in the infant's diet. Cream is wanting because of the poor, watery milk used. Nitrogenous matter is in too small amount, because when the child vomits its milk something is substituted which contains little or no proteid, especially farinaceous food. It is obvious that no amount of predigestion or dextrinising of starchy foods can put nitrogen into them.

To sum up, rickets is due to improper diet, is predisposed to by inherited weakness of constitution, and is fostered and made worse by bad hygienic surroundings and by parental ignorance and neglect.*

Rickets is most likely to develop between the middle of the first and the end of the second year, but it may be even earlier or later than this.

Scurvy.—This is another disease † caused by defective diet which has attracted a good deal of attention of late years. It is well known that the disease called scurvy, which was formerly the cause of so much suffering and loss of life in the navy and merchant service, is due principally to the deficiency of certain elements from the diet, and that these elements are supplied in our ordinary diet by the fresh animal and fresh vegetable food which we take. For instance, meat juice, milk, potatoes, and cruciferous plants and certain fruits, especially lemons and limes, are antiscorbutic or scurvy-preventing. Various unsanitary conditions combined with the defective diet help to produce the disease. Scurvy is not often seen now. The diet of most people under ordinary circumstances includes sufficient of the requisite kind of food, and where long voyages are made care is taken to provide an antiscorbutic diet. It is for this reason that lime juice is taken in Arctic and other long expeditions.*

---

* It is, however, very difficult to make any one theory fit all cases of rickets. Occasionally we find the disease where none of the above causes seem to be in action, and sometimes we do not find it where conditions which seem adequate to produce it are present. We know well many of the links in its causation, but not the whole chain.

† See a good article by Sir T. Barlow, *Med. Chir. Soc. Transactions*, vol. lxvi., and especially his Bradshaw lecture, *Lancet*, Nov. 10, 1894; also Dr. Cheadle's articles, *Lancet*, Nov. 1878 and July 1882; and his work on *Artificial Feeding and Food Disorders of Infants.* See also article by Dr. Cheadle in Allbutt's *System of Medicine*, vol. v.; and by Dr. Colman, *Practitioner*, 1905, vol. lxxv., p. 529.

A very important service has been rendered to medicine, by the recognition of the fact that in children who are fed artificially by those ignorant of the principles of the art, the diet may be so defective in scurvy-preventing elements that a form of scurvy may develop in the infant.

Special stress must be laid on the want of fresh new milk in the diet of infants. Milk long kept and much "treated," as by repeated boiling, cannot be depended upon for scurvy-preventing powers. See also p. 69.

The principal symptoms of the fully developed disease are as follows:—The gums are swollen and spongy, and are apt to bleed, especially at the place where a tooth is being cut. There will probably be also a very offensive odour from the mouth. There are tenderness and swelling of the limbs in general and of the legs in particular, the soft parts as well as the bones being swollen. The bones are swollen along the length of the shaft, and not at the ends only as in rickets. The child is pallid, sallow, wasted, and possibly feverish, is very fretful, and fears to move the tender limbs. There may be spots like bruises on the skin. The urine may contain blood. The disease is curable if dealt with in time, and, better still, is preventible.

Now, although the fully developed disease may not be very commonly seen, many children who do not develop the above train of symptoms may fail to thrive, and may fall into ill condition because the antiscorbutic element in their diet is deficient. Hence the above considerations teach us an invaluable lesson as to the constituents of a healthy dietary.

Rheumatism.—To this also we must direct attention. There is a popular fallacy that a child can be "too young for rheumatism." Children are very liable to this condition, only the joint affection is often insignificant, while heart affections are severe. It is a common and painful experience to discover in children brought to hospital for general weakness and failure of health the presence of valvular heart disease. Amongst causes which are preventible, we may mention cold and damp. Cold acts often on account of *insufficient clothing* (see Chap. vi.), and undue exposure and from draughts. Damp—from damp feet, damp clothes, sitting on damp ground, damp dwelling-houses,

---

* Lime juice is prepared from the fruit of the lime, *Citrus limetta*, and must not, of course, be confounded with "Lime water," a solution of the mineral "slaked lime."

(especially cellar dwelling-rooms), and damp beds. We emphasise the need of *precautions against rheumatism*, as part of the hygiene of infancy and childhood. The so-called "growing pains" are commonly rheumatic.*

Respiratory Disease.—Pneumonia and bronchitis affect the extremes of life. In England and Wales alone 10,000 children die annually of bronchitis and another 10,000 of pneumonia, and the urban rates are about 80 per cent. in excess of the rural (Newman). Exposure of infants to cold and damp has much to do with this, so have bad ventilation and alternation from hot stuffy rooms to cold and draughty ones. Rickety children fall ready victims to lung diseases, and when epidemics of measles and whooping-cough effect slum children, lung complications are often the immediate cause of death.

Convulsions and Nervous Disease.—A word may be said on this head because of the very large mortality attributed to this cause in the tables here given. The deaths of 13,000 children in England yearly are attributed to "convulsions." This is the name of a symptom and not of a distinct disease, and may be due to many different causes. Constitutional disease, such as rickets, is often the predisposing cause. The onset of any acute febrile disease may be marked by convulsions in children. Inflammation in the brain, or any kind of blood poisoning, or reflex irritation from teething, or worms or acute indigestion, or other irritant may bring them on. Injury to the head at birth, or falls on the head or blows may act in the same way. Hence it is impossible to say in brief how such may be prevented.

We will now give, in a tabular form, the principal causes which hinder the thriving of infants.

TABLE SHOWING PRINCIPAL CAUSES WHY INFANTS FAIL TO THRIVE.

I. Congenital Causes.

Premature birth, with consequent puny size and feeble development.
Plural pregnancy.
Diseases of child before birth, malformations and defects.
Injury at birth, and diseases incident to birth.
Want of proper care at time of birth or in newly-born state.

---

* The student is referred to Dr. Cheadle's work on *The Rheumatic State in Childhood.*

Actual diseases transmitted from parents, such as tubercle, syphilis, acute infectious disease.

Feebleness of constitution transmitted from the parents from causes such as the following:—Parental insanity or intemperance, acute or chronic disease, destitution. Especially over-work, disease, injury, loss of blood, mental shock, great anxiety or semi-starvation during pregnancy of mother.

II. Unhealthy Environment.

(*a*) *The locality inhabited may be characterised by:—*

Over-population, absence of open space, deficient sunlight.
Want of fresh air, atmosphere fouled by various causes.
Dust and dirt.
Unhealthy, undrained soil.
Unwholesome or inadequate water supply.
Prevalence of endemic disease.
The child may be living in a tropical climate, perhaps malarious.

(*b*) *The dwelling-house may be:—*

Damp, cold, ill-ventilated, ill-drained, badly built, out of repair.
Dark, overcrowded, having unhealthy foundation; or characterised by
Defective water supply, bad or inadequate sanitary arrangements, offensive middens, &c.
The nursery or sleeping place of the child in particular may be unhealthy.

III. Faults in respect of Natural Feeding.

The mother may not suckle the infant, or may not have enough milk. She may lead an unhealthy life, or be in bad health. The milk may be poor, or may disagree with the child. The mother may take unsuitable food or drink. She may suckle too long.

If a wet nurse be employed, she may be unsuitable.

IV. Faults in respect of Artificial Feeding.

(*a*) The milk may be unwholesome. It may be dirty or sour, or contain germs of disease or be adulterated. It may contain chemical preservatives.

(*b*) The milk may be wholesome, but poor; or not properly prepared by dilution or otherwise.

(*c*) The diet of the child may be deficient in one of the following elements:—

Proteids.
Fat.
Carbohydrates.
Salts.
Antiscorbutic element.

(*d*) The child may be fed on food which it cannot properly digest, and especially may be prematurely fed on starchy food.

The child may be overfed or underfed. The food may be badly prepared or not fresh.

Harmful articles of diet may be given, such as tea or alcohol.

V. Faulty Hygiene.

The child may be generally neglected, or entrusted to inexperienced or careless nurses, perhaps to juveniles.

Accidents may occur, such as burns, scalds, severe falls, blows on the head.

Overlying.

The child may not be taken out enough. May be kept in hot, ill-ventilated rooms. The air may be fouled by gas.

The child may be over-exposed, inadequately clad, allowed to be chilled.

It may not be allowed sufficient sleep, or may be too much disturbed and excited.

It may be unwashed, chafed, excoriated.

It may have lice, itch, &c.

Its ailments may be unobserved or neglected.

It may habitually suck a "comforter."

It may be treated with deliberate cruelty, perhaps associated with illegitimacy, or baby-farming, or infant-life assurance.

It may be drugged.

VI. Presence of Actual Disease.

From some one or more of the above causes, or from infection, the child may have acquired disease.

Most common examples:—(*a*) Disease of stomach and bowels, from bad feeding, &c.

(*b*) Constitutional disease, rickets, scurvy, tuberculosis, rheumatism, anæmia, syphilis.

(*c*) Acute disease, leaving chronic disease or debility, such as measles, whooping-cough, scarlet fever, pneumonia, bronchitis.

In considering what has been said in this chapter, the reader cannot fail to be struck with the number and variety of the causes which produce feeble health or mortality in infancy. Life is most apt to perish in the earliest stages, and whatever affects the condition of the life of the people in general, affects infant life in particular. Thus it comes to pass that when municipal authorities, and the constituencies who elect them, suffer their rivers to be poisoned, their atmosphere to be fouled and darkened, their sewage system to be faulty, their scavengers to be inert, their water to be bad; when jerry-builders have free play, when slums increase, when parents are ignorant, destitute, indifferent, those who suffer the most will never complain, but will simply droop and die.

All the problems of sanitary and social science seem to be focussed in this one. It would seem as though before infant mortality can be properly dealt with, we must cure poverty, intemperance, urban overcrowding, as well as ignorance and immorality, and, in brief, reform society! But ours are not counsels of despair. If we cannot save all, we can save some. There is a way to better things, and there is much that can be done.

The principles of the healthy rearing of the individual child are fairly well understood, and we will proceed to show that organised efforts to apply such principles amongst the most needy classes of the community in this country and in others, have already been attended with no inconspicuous degree of success, and that much greater success awaits in the future those who are willing to work.

In our next chapter we will discuss briefly the prevention of infant mortality in the community at large, and in subsequent chapters the treatment of the individual child in detail.

CHAPTER III.

THE PREVENTION OF INFANT MORTALITY.

PURE MILK SUPPLY.

THE BEGINNINGS OF BETTER THINGS.

The first step towards the organisation of a national effort to lessen infant mortality is that the facts should be known and people convinced that reform is urgently needed and practicable. There is ground for encouragement on this head, for there never was a time when the problem was stated with such cogency as to-day, or when so much literature, free from unnecessary technicalities, was available for popular study. To the *Physical Deterioration Report* allusion has already been made. As examples of other excellent works may be mentioned a recent volume by Sir John Gorst, *The Children of the Nation*,* and another by Dr. Newman, of Finsbury, on *Infant Mortality*.† Of both of these free use has been made in this chapter, and references to others will be found as we proceed. In almost every large town to-day there are those who are working out the practical solution of the difficulties involved, and though there is much that is still in the experimental stage, real success can be recorded, with promise for the future.

The creation of strong and enlightened public opinion is essential if laws are to be made and amended and facilities obtained, for it is impossible to work for the public good without interfering with private interest, and, unless the citizens are in earnest, sanitary laws, hardly won, become dead letters. On the other hand, when a number of people are determined upon reform, great things may be done by co-operation and private enterprise without biding the law's delay or waiting for parliamentary compulsion.

Let us now consider what measures offer the most prospect of benefit.

---

* *The Children of the Nation: How their Health and Vigour should be promoted by the State.* By the Right Hon. Sir John Gorst. Methuen & Co.

† *Infant Mortality: A Social Problem.* By George Newman, M.D., &c. Methuen & Co.

Prevention of the Employment of Women in Factories to the Detriment of the Bearing and Rearing of Healthy Children.—It is now illegal to employ a woman in a factory within a month of delivery—that is to say, the firm are liable if they knowingly employ her. Here is an obvious loophole, for an employer can escape the law by pleading ignorance. Up to 1904 there had been only three prosecutions under this law, although its neglect is notorious (Gorst, *op. cit.*, p. 21). It is now recommended (*P. D. Report*, p. 88—26 and 27) that the onus of obtaining proof should rest on the employer, or, at least, that he should obtain a medical certificate that such return to work will not be prejudicial to the health of the woman and that reasonable provision has been made for the child. It must be said that the women are often themselves to blame, for they will conceal the fact of recent delivery, or make misstatements, or after labour apply to a fresh employer. In some places public opinion amongst the workpeople is against the early working of the women. Something might be done to foster such a sentiment elsewhere.

We must acknowledge the efforts to see that the law is not broken, made by certain firms, who, as far as possible, avoid employing women during the child-bearing years; but, in many manufacturing centres, such employers are hard to find. In some other countries the law is more stringent and better enforced.

The abstention from work should begin some time before delivery, but, as this means expense to the woman by reason of loss of wages, and as some provision to meet this will be necessary, it is suggested in the Report that, in manufacturing towns, charitable efforts might well be directed towards endowing and maintaining insurance organisations to which employees, assisted with voluntary contributions, could contribute while in work, and from which they might receive assistance during the whole period of confinement and afterwards. Such plans are adopted in Prussia and France, and municipal assistance is given to the funds (Gorst, *op. cit.*, p. 221).

As an illustration of this, and as an example for imitation, we may refer to the Society for Nursing Mothers in France, which provides homes into which destitute mothers are received before confinement till the time comes to transfer them to lying-in hospitals; undertakes the maintenance or part-maintenance of these mothers during the first year of their infant's life, so that these may be properly cared for by their own mothers; watches over the growth and health of the child, and even helps to feed the mother, so as, indirectly, to feed the child. To give free meals to nursing mothers, so as to maintain a good supply of breast milk, is an idea which has been worked out also in the Madame Coulett Restaurants in Paris. The benefits conferred by these institutions are very strikingly seen in the flourishing condition of the children and the reduction of infant mortality.

Dr. Ballantyne, of Edinburgh, has advocated the establishment of *Pre-maternity hospitals* for the care and treatment of pregnant women. This most excellent proposal deserves to be developed and put in operation (see *British Med. Journ.*, 1901, vol. i., p. 812, and 1902, vol. ii., p. 65; also 1908, vol. i., p. 65).

Crèches and Day-Nurseries.—To meet the difficulties caused when the mother goes out to work and leaves her children inadequately cared for, establishments may be provided where they may be nursed, fed with good food, and kept in healthy surroundings until evening. This will often be a great improvement on the conditions of the child's home. Also, the crèches are under medical inspection.

It has not been found possible to run these on commercial lines, and they are chiefly charitable institutions. The average cost is about 3s. 3d. per week per child, but even under experienced management, only about two-thirds of this is recovered. The usual charge is about 2d. to 3d. per day, some being free. The children benefit greatly in various ways. This is another method which, having been approved by experience in many places, might be largely adopted in the poorer districts, and the crèches might be made schools of practical instruction for young women in child management.

In France and Germany a similar system prevails, with municipal help, to an extent not seen in this country. Much information on this point will be found in the evidence given before the Physical Deterioration Committee by Miss Eves, who has had interesting and valuable experience at the crèche associated with the Maurice Hostel.*

Instruction on Infant-Rearing.—In view of the very great extent to which infant mortality is due to maternal ignorance, various methods may be employed to convey instruction to mothers and nurses, as we now proceed to show.

Municipal Organisation.—In many towns Lady Sanitary Inspectors are employed, who, working under the direction of the Medical Officer of Health, visit houses where births have taken place, inspect the conditions of the home, and give advice to mothers on the feeding and management of their infants.

---

* See the *P. D. Report*, vol. ii., p. 290 and onwards. See Newman, *op. cit.*, p. 271.

They also inspect the work of the midwives, visit houses where children have died, and make reports to the Medical Officer of Health. In other places lady health visitors are employed, who, though not bearing the name of inspectors, undertake similar service and are sometimes assisted by voluntary workers, all acting under municipal direction.*

For example, we will quote what is done in Leeds. Lady Sanitary Inspectors are employed who, in certain parts of the city, visit every house where a birth is known to have occurred and make enquiries according to a schedule with which they are supplied. This schedule includes the following items:—Name, sex, date of birth, legitimacy, date of visit, "Sanitary Leaflet" given, doctor or midwife attending, age of mother, previous confinements, &c., health of mother, employment before and after labour with date of cessation and resumption; how child is fed and by whom nursed, where it sleeps, whether a "comforter" is used, or drugs given, date of vaccination, whether properly clothed; notes on environment—cleanliness, rooms, inmates, kind of house, nuisances and any other matter requiring attention; notes of subsequent visits and inspection.

Another schedule on similar lines is provided for visiting houses where deaths of infants have occurred. (See *Appendix* I.)

Private Benevolence assisting Municipal Organisation.—The best example that can be given of this is what is now well known as "The Huddersfield Experiment." Huddersfield is a large manufacturing town, and one of those which showed a decrease in population at the last census. Mr. Benjamin Broadbent, when mayor of that town, offered a premium of £1 for each infant who, being born during the year of his mayoralty, attained the age of twelve months. This, combined with visiting and advice from a committee of ladies, was followed by a marked reduction of infant mortality amongst the class concerned, and afforded a very striking proof that infant mortality can be lessened by stimulating parental care and enlightening ignorance. (See *Appendix* III.)

Hygienic Leaflets.—Short leaflets containing printed directions for the guidance of mothers in infant-rearing are issued by many municipalities, by certain hospitals, and by private associations. The fault is often committed of making these too elaborate. They must be short and very clear to be of use. It is also necessary that they should be supplemented by verbal instruction. It is best to have three different leaflets. The first should give directions for the breast feeding of infants and for general management in this period of lactation. The second should be for use in artificial feeding of infants who cannot be suckled, but should not be given, unless it is certain that the mother cannot suckle, or else she will be encouraged to adopt artificial feeding unnecessarily. The third is for use for children in later infancy and after weaning, and this again must not be given too soon. Examples of such leaflets are given in the *Appendix*.

---

* See paper by Dr. Spottiswoode Cameron, *Report of National Conference on Infant Mortality*, p. 65.

Philanthropic Associations for Promoting the Welfare of Mothers and Infants.—There are many such to be found in this country, some of considerable standing. One of the best known is the Manchester and Salford Ladies Public Health Society now twenty-five years old, of whose activities and methods an account is given in the second volume of the *P. D. Report*, p. 282. It has been of great service to the corporations concerned, both as regards general sanitary reform and in respect of infant mortality. In London the Marylebone Health Society is an institution for giving advice and instruction to mothers with young children, and the newly started St. Pancras Mothers' and Infants' Society carries on similar work, and gives meals to underfed mothers during lactation. These are but illustrations of what is being attempted on a larger or smaller scale throughout the country. One hears constantly of experienced lady workers who, in a quiet way, are holding mothers' meetings and using them to convey hygienic teaching of great value.*

The instruction of midwives in infant-rearing is a very important part of their training, and as the new order of midwives develops we may hope for much from their assistance. **Parish and district nurses** are being instructed and utilised in the same way.

Trained children's nurses are educated and provided by such institutions as the Norland Institute, Holland Park Avenue, London, W., and the Princess Christian College at Withington, Manchester. A very useful kind of occupation for well-educated girls is thus opened.

The idea that **instruction in domestic hygiene** should form part of the education of girls is very properly urged by many, but if this is to be successful in regard to the management of infants the instruction must be practical and must be given in some institution where the infants are actually nursed. Hygiene may be taught in schools, but infant-rearing must be taught clinically, just as the medical student must walk the hospitals and visit the dispensaries, without which his medical studies would be worthless.

---

* For valuable suggestions see a recent pamphlet entitled *A School for Mothers*, with introduction by Sir Thos. Barlow. London, H. Marshall & Son. Price, 1s.

It is anticipated that earlier notification of births will materially assist the work of the health inspector, for hitherto in many cases the birth of the child has not been heard of by him until its death has been registered, and six weeks is the present limit for registration. The Act of Parliament recently passed provides that in all districts where the Local Authorities adopt the Act, or has it imposed upon them, every birth must be notified to the Medical Officer of Health *within thirty-six hours*, and this applies not only to living children born at full term but to the case of *every child dead or alive separated from its mother after the twenty-eighth week of pregnancy*. This will secure the notification of still-born and premature children of seven months and onwards. This is a very great gain. It must be borne in mind that such *notification* to the Medical Officer of Health does not supersede or render non-obligatory the *registration* by the registrar of births as carried out at present.

Sanitary Reform.—Referring to the table given on p. 55, and to the causes included under the heading of "Unhealthy Enviroment," we must recognise that widespread efforts are being made to improve the conditions of urban life; and, though it cannot be affirmed that the remedies are overtaking the disease, yet it is at least true that remedies are being sought and applied, and that there is some improvement to record. In London these evils exist on such a colossal scale that, even where much has been done, little change may be apparent, but in many provincial areas the improvement of urban conditions is more evident. We are told that "insanitary areas" do not in many parts mean what they did ten years ago. "Rookeries," blind courts, and cellar dwellings are disappearing, and the erection of back-to-back houses is being prohibited. Wide streets are being driven through congested areas, and open spaces and parks are being provided. (For example, in the borough of Leeds to-day, with an area of 21,572 acres and a population of 477,000, there are 25 open spaces or parks, covering an area of 1,175 acres, and an extensive insanitary area, marked out for treatment, shows some fine thoroughfares where the worst slums used to be. Leeds has not, however, taken a strong position in regard to back-to-back houses.)

The water supply of our cities is vastly better than formerly; quick access to residential suburbs by workmen's trains and cars is provided; and we are beginning to hear of garden cities and garden suburbs, and of enlightened employers who try to secure ideal conditions for their workpeople, as at Port Sunlight and Bourneville. The infant mortality at Bourneville is only 78·8, whereas in the adjacent city of Birmingham it is more than twice as great.* So much remains to be done that progress may seem almost imperceptible, but we may fairly maintain that, having touched the bottom, there is a beginning of better things in the land, with hope for the betterment of the conditions affecting maternity and infancy in the future.

Amongst improvements which are most needed to further this process is a stringent method of dealing with **overcrowding**, and the *P. D. Report* recommends that a fixed standard of overcrowding should be set up, which must not be exceeded in our urban areas, and that where towns are extending in area, the prevention of new slums and the preservation of open spaces should be secured by law. At the same time, the housing of the country labourer requires special attention, for it is impossible for some of these to find healthy cottages in which to rear their children, and the benefits of country life are being neutralised by insanitary dwelling-houses.

We wish that something satisfactory could be said on the question of **alcoholism**, which is at the root of so much suffering and death. The hope of better things in England lies in training the children of England in knowledge of the dangers of alcoholism, in the principles and practice of temperance, and in giving to the working classes the comfort and social opportunity, which the public-house affords, without the temptation to drink; as well as in well-judged advocacy of temperance and legislative reform. On this subject, the work of Rowntree and Sherwell may be strongly recommended for study.†

It is a miserable fact that the present system of **infant-life insurance** should have the effect of making the lives of children less desirable to inhuman parents. It is suggested that if societies were not allowed to pay money down in case of death of insured infants, but only to discharge the funeral expenses, the evil referred to might be avoided (see *P. D. Report,* vol ii., p. 137). Dr. Newman thinks that the extent of this evil is not so great as is sometimes stated.‡

In regard to the mortality and ill-usage of children which is associated with "**baby-farming**," attention is drawn to the provisions of the Infant Life Protection Act of 1907, which gives facilities for action in checking abuse by requiring any one who receives more than one infant for hire or reward under five years of age, to give notice to the Local Authority, who must then inspect regularly the infants and their surrounding conditions, and give any advice and direction that may be necessary. The number of infants to be received at any one dwelling may be limited. Also, any one receiving a child under two years old in consideration of a sum of money, without arrangement for further payment, must give similar notice, and thereafter become subject to appropriate inspection. Penalties are duly provided for offences under the Act.

---

* See *British Med. Journ.*, August, 17, 1907, p. 408.

† *The Temperance Problem and Social Reform*, by Joseph Rowntree and Arthur Sherwell. Hodder & Stoughton, 1899.

‡ Newman, *op. cit.*, p. 284.

Pure Milk Supply.—To rear healthy children, pure milk is essential. Failing the maternal supply, and in all cases after weaning, pure cow's milk, the staple diet of infancy, is the first requisite. If the problem of its supply to all classes of the community could be solved, the fall in infant mortality would be enormous; but milk, as sold in towns and administered to children, is often filthily dirty, sour, and impregnated with dangerous germs, and so may prove an infant poison. The provision of a pure milk supply is one of the first concerns of the municipality, and it occupies the attention of every sanitary authority in the country. The chief causes which render milk unfit to be given to infants and children are :—

1. Ill-health or ill-condition of the cow, especially tuberculous disease.

2. The food of the cow may be unsuitable; it may be fed, for instance, on turnips, brewer's grains, or distillery refuse, or the animal may drink contaminated water in the field.

3. The cowshed may be unhealthy, being foul, unventilated, dark, and damp.

4. There may be want of cleanliness in the process of milking, and especially in the hands and person of the milker, so that dirt enters the milk in the cowshed. In fact, unless special care be taken, milking is likely to be a very dirty process.

5. There may be want of cleanliness in the vessels used for receiving, carrying, or storing the milk. Much dust may enter it as it is carried round the town, or dispensed in small quantities in the shops. Examination of milk bought in the lower parts of the town often reveals a very dirty condition.

6. The milk may be kept in an unhealthy atmosphere, as, for instance, one contaminated by sewer gas.

7. The water used for diluting the milk or washing the milk-cans may be unhealthy.

8. The milk may be adulterated in various ways, as, for instance, by chemical preservatives.

9. The milk may be sour from lapse of time, or from keeping in a hot place or in sour vessels.

10. There may be infectious disease amongst the dairy staff, &c.

Household Milk Supply.—There are three ways in which the household milk supply is obtained :—(*a*) First, there are the favoured few who live where cows are kept, or near a properly supervised and organised dairy, and who are therefore able to get their milk direct from the cow. In India and other tropical countries the plan has to be adopted of having the cow brought to the door and milked in your presence, under vigilant observation. We quote from Dr. Emmett Holt the following directions for dealing with milk in the home when it can be obtained fresh from the cow :—"That to be used for infants should be strained through a thick layer of absorbent cotton or several thicknesses of cheese-cloth . . . into quart glass jars or milk bottles, which should be covered or cooled immediately, best by placing the bottles quite up to their necks in ice water or cold spring water, where they should stand for at least half an hour. That required for children who take plain milk may now be poured into half-pint bottles, stopped with cotton-wool, and put in the ice-chest or the coolest place possible. The first rapid cooling is very important, and adds much to the keeping qualities of the milk. Milk loses its heat very quickly when cooled in water, but very slowly when it is simply placed in a cold room." After standing four or five hours, the "top milk" may be removed; after twelve to sixteen, the cream may be removed—if these are required for preparing "modified" milk, as described in the next chapter.

(*b*) Secondly, there is the method, which is certainly the best for distributing pure milk in towns, for preventing contamination in collecting and distributing the milk, and for retarding the changes which all milk will undergo in time :—The milk is to be collected at model dairies under proper supervision and inspection; to be cooled by refrigeration after filtration; to be put into bottles which are sealed, kept cool in transit, and delivered, without loss of time, to the consumer. The consumer will do well to cool it on receipt, and store in the coolest place available; if it has been bottled at a dairy, the cream or top milk may be removed after half an hour or so.

This plan is widely used in America, but, till lately, has been almost unknown in this country. Dairy companies are beginning to open, in most towns, depôts for the supply of pure milk on these principles. Moreover, dairy laboratories of the Walker-Gordon type will supply the milk, already "sterilised," or "Pasteurised," or "modified," to order.

(*c*) The third method, which is almost universal in this country, is to buy the milk in bulk as it is brought to the door twice daily by the "milkman" on his "round," or to buy it, as the poor do, retail at the shops. Such milk may be of any age or any degree of impurity or poverty, according to circumstances. The amount of cream that will rise on standing is a very doubtful and variable quantity. In most towns such milk is usually from twelve to twenty hours old before the child gets it; in others it is over twenty-four hours old.

The advantages of the second method are so incontestable that the question would be settled were it not for the cost. Pure milk cannot be bought so cheaply as that which the poor buy from the retail vendor. In Leeds, for instance, pure milk costs fourpence per quart, which is at least a penny dearer than ordinary milk. The provision of good pure milk is so essential to the lowering of the death-rate amongst infants, the benefits of obtaining it are so very great, and the difficulties which lie in the way of the poor are so serious, that at present the only way of meeting them seems to be the establishment of **depôts for the supply of pure milk**, subsidised by private subscription or by municipal aid.

Such depôts have already been tried in a more or less experimental way in many places. The experiments all prove the great and immediate benefit which the infants derive, especially as there is usually supervision of the infants fed, but always there is the difficulty that the depôts cannot be carried on on commercial lines as a paying business. More than one, otherwise successful, attempt has been abandoned on this ground. In Manchester a scheme was discontinued for this reason. We had a similar experience in Leeds, where the opening of a few depôts caused a reduction of 25 per cent. in the infant mortality amongst those affected. In Liverpool the Corporation bear the loss. There is also some disposition for the "trade" to object to the selling of milk under cost price and to municipal trading in milk. Also, the customers at milk depôts may be found to belong to a better class than those for whom the benefit is designed.

Milk depôts, subsidised by municipalities, have been long in use on the Continent, and are of French origin. We would speak in terms of warm appreciation of the various methods which have been employed in France to promote the rearing of healthy children, for the French physicians have been pioneers in this work. Besides the work which Tarnier and Budin did in relation to the rearing of premature infants, of which we shall speak in Chapter vi., the late Professor Budin established in Paris the *Consultations de Nourissons*, which are medical institutes for infant-rearing, and which are an extension and development of similar work originated by Herrgott, of Nancy. To these "Consultations" mothers are encouraged to come weekly, bringing their infants. These are weighed and inspected, the mothers are urged to suckle, but, if they be unable to do so, advice is given as to artificial feeding, and its progress is supervised; sterilised milk is distributed, and gifts are made to the mothers in money and in kind. The results of these institutes have been most satisfactory. Associated with these are the *Gouttes de Lait*, which are milk dispensaries where infants are fed on sterilised milk under medical supervision. The results are an increased number of mothers suckling their children, lowered infant mortality, disappearance of infantile diarrhœa, and a larger number of strong and healthy children who can resist infection and go through the complaints of infancy without succumbing.

Such institutions exist also in New York and elsewhere, and are being introduced into this country. A good account of this subject is given by Dr. M'Cleary and by Dr. Robinson in the October (1905) number of *The Practitioner*. Dr. Newman (*op. cit.*, p. 289) describes the milk depôt at Finsbury, and his work on *Infantile Mortality and Infant's Milk* may also be consulted. Some interesting photographs, illustrating Budin's "Consultations," will be found in a small work by H. L. Heath—*The Infant, the Parent, and the State* (King & Son).

The quality of the public milk supply could be greatly improved by fixing a standard of purity and making illegal the sale of milk which falls below this.

The Sterilisation of Milk.—Sterilisation means heating milk to boiling point, or even higher, for an hour or more to destroy germs, and then hermetically sealing the bottles in which it is contained. They are opened only when required for immediate use. **Pasteurising** means heating the milk to 155° to 150° F. for a shorter time, say twenty to thirty minutes.

Even the newest and best milk contains some germs, although many of these are harmless, or are only milk-souring germs; but many sources of contamination have been indicated, and in old and carelessly-handled milk the germ contents are enormous, especially in hot weather.

The danger of the presence of tuberculous or other specific germs, such as those of typhoid fever, must be borne in mind. Because such germs are destroyed by boiling, and because sterilised milk in bottles keeps without turning sour for a much longer time than ordinary milk, sterilisation has for many years been widely recommended and practised in this country, on the continent of Europe, in America, and elsewhere, including various tropical countries. At the present time there is a growing opinion that if pure fresh milk be supplied with all the necessary precautions, it is to be preferred to sterilised milk under ordinary circumstances, for no amount of sterilising can make sour milk sweet, or dirty milk clean, and if precautions be taken to secure pure clean milk, then sterilisation becomes unnecessary, as will be explained immediately.

It is considered by many good authorities that the prolonged use of sterilised milk shows that its digestive and nutrient powers are impaired, and that its **scurvy-preventing power is lessened or destroyed.** To Pasteurising milk these objections apply very much less, if at all.

It is only right to say that the amount of scurvy traceable to the sterilisation of milk is very small in proportion to the great number of children who have been reared on it without detriment. Also, the late Professor Budin and his followers deny that sterilisation does produce scurvy, and their opinion is deserving of respect. The general opinion, founded on experience in this country, seems to be that the more milk is boiled, reboiled, and "treated," the less nutritious the milk, and the greater the danger of scurvy, the climax being reached in condensed milks and in dried milk foods. It would seem that for the production of scurvy there are needed a negative and a positive factor. The negative factor is the absence of some normal property of the milk when thus treated, and the positive factor is the presence of a toxic product. Dr. Colman, in a valuable paper on this subject, says that in a case where a dried milk food was causing scurvy, the administration of fresh milk and antiscorbutic agents did not cure the disease until the food in question was discontinued.*

As the result of observations made in South Africa during the Boer War, and reported in the *Transactions of the Epidemiological Society of London*, 1903-4 and 1907, Dr. Myer Coplans has adduced strong evidence for believing that scurvy is caused by **infection of the gums** around the socket of a tooth or at the site of an erupting tooth. Food, decomposing or otherwise, may act as the vehicle of such infection.

---

* See the October number of the *Practitioner* for 1905. This special number of the *Practitioner* contains various papers bearing on the questions discussed in these pages, and may be consulted with advantage by the student.

Recent Observations on the Antiseptic Powers of New Milk.—Some recent observations made by the same pathologist in the pathological department of the University of Leeds will throw much light on the exact relation of new to sterilised milk.*

These observations were made by inoculating milk with known germs, and watching their behaviour. They show that new milk has certain properties of **destroying germs** or **preventing their growth** which are not possessed by boiled or stale milk.

(*a*) In milk fresh from the udder, and preserved at *blood heat*, there is for one hour slight germicidal power and absolute inhibition of growth. There is partial inhibition for the next four hours, but after the sixth hour growth is unrestrained. If the milk be boiled at the first, no such germicidal or restraining powers are observed.

(*b*) If the milk be kept at the *temperature of the air*, there is slight bactericidal action for six hours, with absolute inhibition. From the sixth to the twenty-fourth hour there is some inhibition; after twenty-four hours there is growth as rapid as in boiled milk.

(*c*) If, after being kept twenty-four hours at *freezing point*, the milk be raised to air temperature, there is slight bactericidal action with absolute inhibition for three hours, partial inhibition from the third to the ninth hour; after that no inhibition.

The effect of Pasteurising is similar to that of boiling.

The addition of chemical preservatives paralyses the bactericidal power of the milk, although the germs do not increase, but when the milk is subsequently diluted, the germs grow as in boiled milk.

Conclusions from these Observations.—Hence, to preserve the powers of destroying bacteria and restraining their growth in milk, it must not be boiled after milking, and "preservatives" must be omitted. The milk must, immediately after milking, be cooled to air temperature at least, and as much lower as possible. At air temperature, milk which is twenty-four hours old should be boiled, as it then possesses little inhibitory power. Supposing an infant to be fed twice daily on new milk delivered twice a day, and kept at air temperature, it will lose about three-fourths of the natural germ-destroying and germ-restraining power of milk. To preserve this properly, the milk must be kept refrigerated.

---

* See article "On Some Vital Properties of Milk," by Dr. Myer Coplans, *Lancet*, October 19, 1907.

This is a strong argument for feeding infants with new unboiled milk, which enters the stomach and bowels with its normal antiseptic properties, as in nature's own methods. It is an overwhelming reason for breast-feeding, and shows again why the troubles of infancy so often begin with weaning.

While it is plain that it is best to use milk which needs no boiling, it does not follow that there is no place for the steriliser. Emmett Holt, whose opinion we shall be safe in following, says that the steriliser should be used under the following conditions:—

1. In warm weather, when milk cannot be obtained fresh, and hence always in cities during the summer.
2. When one cannot be sure that the cows are healthy, or that the milk has been properly handled.
3. When the milk has been kept for a considerable time—*i.e.*, over twenty-four hours, especially if no ice can be obtained for refrigeration.
4. During epidemics of typhoid fever, scarlet fever, diphtheria, or any form of epidemic diarrhœal disease.

To this we may add that milk bought in the ordinary way in the city slum should always be boiled before it is used for infant-feeding, as will be directed in the next chapter, where the methods of sterilising and Pasteurising milk will be described.

In tropical countries the steriliser will also be useful.

Use of Goat's Milk.—In view of the difficulty which is experienced both in towns and villages of obtaining cow's milk both good and cheap, it is well to draw attention to the fact that very good milk can be obtained from the goat. In many countries this is very generally used. In Belgium and in the United States goat-keeping has much increased of late years, and in this country attempts are being made to promote the practice, and to bring before the poorer people, especially in the villages, the advantages which it offers. In the *Quarterly Review* for July, 1907, there is an instructive article entitled, "The Case for the Goat," which is worthy of careful reading. The *British Goat Society* also has for its object the encouragement of goat keeping, and publishes popular literature on the subject.*

The advantages claimed for the use of goat's milk are these:—It is nutritious, and rich in solids, as appears from the analyses given by Stephenson and Murphy:—

---

* Hon. secretary, H. S. Holmes Pegler, Esq., Kingston-on-Thames.

	Total Solids.	Proteids.	Fats.	Lactose.	Salts.	Water.
Human milk, .	12·59	2·29	3·78	6·21	0·31	87·41
Cow's milk, .	12·83	3·55	3·69	4·88	0·71	87·17
Goat's milk, .	14·29	4·29	4·78	4·46	0·76	85·71

The goat enjoys a very high degree of immunity from tuberculosis. The excrement of the goat is solid, and hence the animal's udder and body generally are cleaner than in cows, which are always more or less soiled with cow-dung, a well-recognised cause of milk-contamination. The goat is cheap to buy and to keep, so that it has been called "the poor man's cow." It can feed on any piece of waste land or be tethered in a field, or kept in a yard or shed, and requires no more room than a big Newfoundland dog. The she-goat is tame and approachable, and even children can manage it. There are certain difficulties to be overcome of a not very serious nature. The goat is apt to run dry in the winter. It may, when loose, jump ordinary hedges and bark trees. But many poor people now keep goats, and feed their children on the milk with conspicuous success. We have found this even in the poorer parts of Leeds, where the animal is kept in a back yard. The subject deserves the attention of the public, for it is not merely a question of feeding the infant, but of supplying good milk throughout childhood.

The milk of the *ass* has been used for infant feeding with success, for it has no excess of casein over human milk. The milk of the *ewe* has also been used, but here the amount of casein is large. Now that the modification of cow's milk is better understood, these varieties need little notice.

SCHOOL OF MEDICINE.
UNIVERSITY OF LEEDS.

CHAPTER IV.

ON INFANT FEEDING.

I. NATURAL FEEDING.

Shall we encourage every mother to suckle her own infant? Without doubt. It is the best thing for the health of the mother, and materially increases the child's prospects of surviving its infancy. Even if the mother does not hope to suckle for the full time, she can, at least, begin and go on as long as possible, and this will be very much better than never giving suck at all, for the old prejudice against "mixed feeding" is unfounded. The decision to wean should be made only on medical advice. Maternity nurses are far too prone to urge the mother to give up trying because of initial difficulties, and there always seems to be some lady friend who comes in and gives advice to the same effect. Preference should always be given when recommending monthly nurses to those who have been successful in persuading mothers to suckle their infants, and who have shown skill in overcoming difficulties.

Until the third day after labour milk will not, as a rule, be present in the breasts in any considerable quantity, but even if the infant should go without food for the first three days, no serious result would be caused. It has been abundantly nourished up to the moment of birth, and it comes into the world with sufficient reserve of nutrition to enable it to wait for the appearance of its natural food at the usual time. There will, however, be some loss of weight in this period, as has been already explained (p. 28).

There is a rooted belief in the minds of ignorant women that a child must be born hungry, and if it puts its thumb into its mouth, this is considered to prove the fact. Hence the child is made to swallow something as soon as it is washed. Butter and sugar is the favourite *bonne bouche*, only some prefer castor oil. The utmost that can be allowed during this period is a few teaspoonfuls of milk and water (milk, $\frac{1}{3}$; water, $\frac{2}{3}$).

Quantity of Breast Milk taken.—It is important to know how much a healthy thriving infant takes in twenty-four hours, because this is a guide in artificial feeding. The following Table is taken from Bouchaud, who made careful observations at the Maternity Hospital of Paris. The amounts are converted from grammes into avoirdupois ounces:—

Amount of Milk taken by Infant at Breast.	At each Sucking.	In Twenty-four Hours.
	Ozs.	Ozs.
First day, at most, . . .	0·10	1·05
Second day, ...	0·53	5·28
Third day, ...	1·41	14·08
Fourth and fifth day, . .	1·94	19·36
First month, ...	2·11	21·12
Second and third month, .	2·5	21·12 to 24·6
Fourth and fifth month, . .	3·5	24·6 to 28·2
Sixth month, ...	4·2	28·2
Seventh month and onwards, .	5·3	31·7

From Tarnier, Chantreuil, and Budin, *op. cit.*, p. 181.

Frequency of Suckling.—The child should be put to the breast from the first—*i.e.*, as soon as the mother has had a little sleep, and within twelve hours of labour. Before the flow of milk is properly established, three or four times in the twenty-four hours will be sufficient.

If it be urged that it cannot be right to put the child to the breast before the milk comes, the answer is that this promotes the secretion of milk, and is also beneficial to the mother in promoting the contraction of the uterus. When the breasts have begun to secrete properly, it is very important that the child should be suckled at regular intervals. Suckle the child at first every two hours during the day, and twice during the night (say eight or ten times in twenty-four hours); but from the earliest time practicable, the child must be accustomed to sleep as long as possible in the night so that the mother may get her necessary rest, say from 11 p.m. to 6 a.m.

In seven or eight weeks the child may be suckled every three hours, from 6 a.m. to 11 p.m., and later on six times in the twenty-four hours may suffice.

These general rules may require some variation in particular cases, but it is surprising to how great an extent regularity of habit may be secured in infants by a little patience. Such regularity is exceedingly good for the mother and still more for the child. When children are fed at fixed intervals their bowels will act at regular times, and the mother, knowing when these are likely to act, will be able to "hold out" the child at such times, and thus an early control over bowels and bladder will be acquired, so that it will be possible to keep the infant dry and clean at a much earlier age than when no such discipline is enforced. Moreover, such a habit is the best possible prevention of constipation and irregular action of the bowels.

Avoid too frequent Feeding.—It is not desirable that the child's stomach should never be empty, and the digestive function never at rest. It is a mistake to feed a child whenever it cries. It may, indeed, cry from hunger, but may also cry because of indigestion, flatulence, and stomach-ache, and this condition may be due to over-feeding, and remediable by reducing the amount taken, and lengthening the intervals. To suckle a child suffering from abdominal pain may give transient relief, but the cry soon recommences, and the condition is no better.

Mode of Suckling.—The infant must be held horizontally lying on the side corresponding to the breast from which it is fed, and supported by the corresponding arm and hand of the mother. With the first and second fingers of the other hand she supports the nipple, and guides it into the child's mouth, inclining her body forward for the purpose. At the same time the fingers can control the flow of milk, and prevent it from coming too fast. The breasts are to be suckled alternately, one for each meal. The child may go on until he is satisfied. He will then of his own accord drop the nipple, and will probably fall asleep, but the newly born child ought not to remain at the breast for longer than above ten minutes, or fifteen at the most.

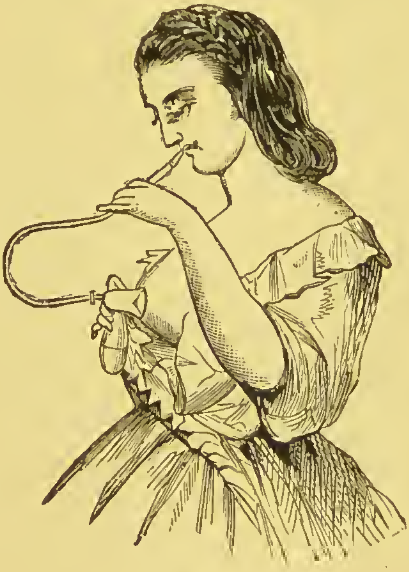
Fig. 12.

Difficulties in Suckling.—The nipples may be flat or retracted, so that the infant cannot take hold. To remedy this the breast may be drawn with a breast pump, of which a good form is given in Fig. 12; or another infant, older and more experienced, may be employed to draw out the nipples; or a nipple-shield may be used. To make the infant take this, it may need to be "primed" by filling it with milk, by suction or otherwise, before it is put to the child's mouth.

Drawing out the nipples is popularly called "breaking the strings of the breast," whatever that may be supposed to signify. Occasionally the nipple is so drawn in that the breast is useless for suckling. This chiefly occurs as a consequence of previous inflammation in the breast, sometimes in infancy.

A considerable number of mothers wean because their **nipples** are sore or cracked and the breasts inflamed. To prevent this the nipples may be hardened during the last month of pregnancy by daily bathing them with spirit. For better class patients eau de cologne may be used, but for the poorer, methylated spirit will do quite well.

When suckling, the nipples should be carefully dried each time after taking the child from the breast and may be treated with glycerine of tannin or glycerine of borax, or dusted with a powder consisting of a drachm of borax with 7 drachms of starch, or of 10 grains of alum in an ounce of powdered gum acacia.

If suckling be very painful a nipple-shield with a rubber teat may be employed, or the breast may be drawn with the breast pump for a day or two till the nipples are better. A knotted tender breast may be gently rubbed with the oiled fingers, and the breast should be supported with sling or bandage or strapping. If such simple methods fail or if abscess threaten, medical advice should be obtained.

Suckling hindered by Sore Mouth.—Soreness of the infant's mouth is a common cause of difficulty in suckling, the child refusing the nipple. The principal cause is thrush, of which mention has been made on p. 48, while the treatment is given on p. 131. During the whole of infancy there is liability to small sores or ulcers in the mouth, some of which are certainly infectious. Teething and scurvy may also make gums and mouth sore. To keep the mouth clean, carefully attending to the space between the lips and gums, and to insist on absolute asepsis of the bottle, teat, spoon, &c., are the great preventives. The promiscuous kissing of babies by all the women and children who come near them is obviously undesirable.

The child may be unable to suck because it is weak and premature. It must then be fed with a spoon. If it cannot swallow properly our resource is in forced feeding (see p. 136). Obstacles are also caused by the presence of hair-lip or cleft palate (see p. 144).

On the subject of *Tongue-tie* see p. 12.

If an apparently healthy new-born child show almost no inclination to suck, although the breasts are full and the nipples healthy, it sometimes happens that its intestines are loaded and that a gentle purgative will set matters right (*Tarnier*). Occasionally we meet with an infant who, without obvious reason, will not take the breast, and has to be fed artificially. These cases are very rare, and success will usually be obtained by perseverance.

Sometimes when a child takes the breast, but never seems satisfied, an entire meal of cow's milk, suitably diluted, with cream and sugar will make all the difference and save the necessity of weaning.

The Wet-Nurse.—If a child's own mother cannot suckle it, recourse may be had to the breasts of another woman. In this country wet-nursing is not in vogue to anything like the extent observed on the Continent. In Paris, for instance, we read of country women flocking into the bureaux, and even borrowing or hiring infants more healthy looking than their own to assist them to obtain the recommendation of the doctors. In Austria we hear even of a strike of wet-nurses with a demand for an eight-hours' day.* Thus the Continental doctor can develop the art of selecting or rejecting wet-nurses, whilst in this country we have often to take what we can get.

In the Selection of a Wet-Nurse† the following principles should guide us:—

She should be a vigorous, healthy, married woman, not under 21, active and intelligent. In particular she must be free from scrofula, tubercle, syphilis, and from alcoholism. She ought to have a good digestion, and be free from skin disease, from carious teeth and offensive breath. She should have no uterine affection, nor suffer from much whites.

How to Judge of the Quality of Breast Milk.—It should be rich, and not too thin and watery. It must be remembered, however, that human milk is naturally thinner and more watery than cow's milk.

The specific gravity may be taken with a lactometer or an ordinary urinometer, and it should be 1,030. That of cow's milk is about 1,029.

---

* *Lancet*, May 19, 1894.

† *Nourrice* is the French equivalent; *Saugamme*, the German; and *Nutrice* or *Batia*, the Italian.

The reaction is persistently alkaline, and the taste is not usually grateful to the adult palate.

Under the microscope the fat globules are seen as in Fig. 14, M. Fig. 14, C, shows colostrum corpuscles. Within a few days after labour these are reduced to an inconsiderable proportion, and in four or five weeks they quite disappear. See also Fig. 13.

The condition of the nurse's own infant presents the best evidence as to the nutritive value of the milk. It should be plump and healthy, and free from signs of rickets or constitutional disease. Other things being equal, preference should be given to a country woman rather than to a resident in a town. She may have been confined two months or more. Most new-born children can take milk from breasts that have been yielding for from two to six months, but the nurse's confinement should not have been too far separated from that of the nursling's mother. She should have good nipples and good-sized mammary glands, but it must be remembered that the large size of a breast may be due to accumulation of fat as well as to gland tissue. Sometimes it happens that one wet-nurse will succeed where another fails, so that if the nursling do

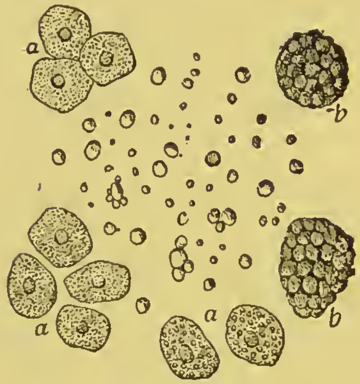

Fig. 13.—Milk from breast when first secreted (after *Gerlach and Tarnier*)—*a*, Glandular cells from the mamma; *b*, colostrum corpuscles; *c*, milk corpuscles.

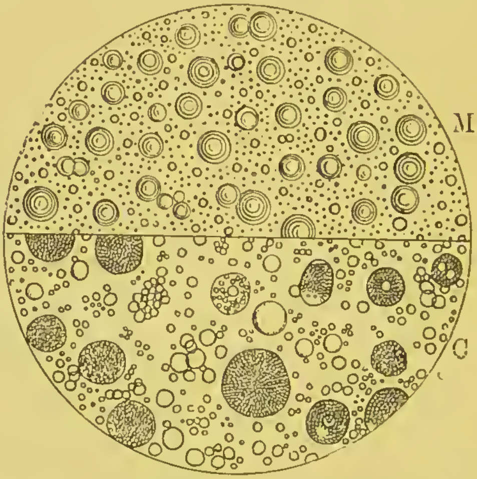

Fig. 14.—M, Microscopic appearance of milk (from Landois and Stirling's *Human Physiology*). C, Microscopic appearance of colostrum.

not thrive, a change may be tried. The occurrence of pregnancy during lactation should be a reason for discontinuing the nurse. If *menstruation* be re-established during suckling, it will often happen that the milk will not agree with the infant, or that the nurse cannot stand the double drain on the system. At the same time, if the milk does *not* disagree with the child, and the nurse keeps well, it may not be necessary to dismiss the nurse. There is another consideration that we cannot overlook. If the employment of any particular nurse would be likely to involve sacrifice of her own infant's health for the benefit of the child of another mother, no medical man would advise the engagement; but Budin records his very interesting observations on wet nurses, which go to show that, within certain limits, the supply of breast milk increases with the demand, so that one need not fear to allow a woman to attempt to suckle another child as well as her own, or to let the mother of twins suckle both.*

Regimen for a Nursing Woman.—A quiet life is needed, with freedom from excitement, worry, and fatigue, with plenty of sleep, regular hours for rising and retiring, regular meals, and gentle exercise in the fresh air daily. Acute mental emotion, such as a violent fit of temper, as well as great fatigue may affect the mother's milk injuriously as regards the child. Hot, close rooms should be avoided. The bowels should be kept regular by laxatives. In a florid woman, with full habit of body and a tendency to constipation, the use of saline purgatives will tend to increase the flow of the milk. Over-feeding must be avoided. This is a mistake sometimes made when wet-nurses are taken to reside in a family.

As a rule, there is needed a generous diet of plain, well-cooked food in good variety. Nitrogenous food increases the richness of the milk more than a diet very rich in fatty element. A fair amount of fluid should be drunk, especially when the milk tends to scantiness. Thus, cow's milk, cocoa, soups, gruel, &c., may be employed, and iron may be prescribed for anæmia. Rich pastry, high-seasoned dishes, and much green vegetable must be avoided. Not much tea or coffee should be taken.

Avoidance of Alcohol.—There is a wide-spread belief that porter and beer are almost necessary during suckling, and they are in exceedingly common use in England to-day for this purpose, but this, like other traditional and popular customs, is being called in question by various authorities to-day. Sir Lauder Brunton,† in his standard work on Pharmacology, says that "Beer and porter stimulate the secretion of milk for a short time, but they produce no proportionate benefit in the child, and nursing mothers are, as a rule, much better without alcohol, and should rather take milk instead."

---

* Budin, *The Nursling*, Lect. iii.

† *Mat. Med. Pharmacology, and Therapeutics.*

On the other hand, the nurslings of mothers who are addicted to alcoholic excess thrive badly and are sometimes liable to convulsive attacks (*Budin*). The alcohol passes into the milk and injures the child. We strongly advise all mothers to nurse without alcohol, believing that they and their offspring are best without it. In view of the spread of alcoholism amongst women, it must also be borne in mind that to recommend an alcoholic regimen for a mother may lead to the establishment of the alcoholic habit, as experience has often shown.

Certain Drugs taken by the Mother are Excreted in the Milk.—As examples, we may instance the active principles of rhubarb, senna, scammony, jalap, nux vomica (strychnine), and of castor oil; sulphate of magnesia, iodide of potassium, and salts of arsenic, antimony, bismuth, iron, lead, mercury, and zinc; copaiba, turpentine, and aromatic oils (such as anise, dill, and cumin).* Opium is another drug of great importance, as it may act strongly on the child. Acids are apt to pass into the milk and cause griping in the child. Quinine passes into the milk in only insignificant quantities, and there is no reason why it should not be given to mothers if they require it, as in malarial districts.† Sometimes the above facts are made use of in order to administer drugs to an infant indirectly through the mother's milk, and sometimes griping and intestinal disturbance in the child may be cured by the mother *discontinuing* something which she is taking, as, for instance, some aperient mineral water.

How Long should Suckling be Continued?—Children should be fed by the breast alone for six months, and if at the end of that time the child be thriving well, and the mother be maintaining her health, no change need be made in the diet. Supplemental feeding may, however, be needed whilst suckling is continued. There is no absolute rule for the time of weaning. Nine or ten months is about the usual time in England, some can go on for eleven or twelve months, but the child should not be suckled after that. It is a good thing to avoid weaning as far as possible in the hotter months when summer diarrhœa is prevalent, say, from the middle of July to the middle of

---

* Lauder Brunton, *loc. cit.*

† See paper by Oui of Bordeaux, *Ann. de gynécol. et d'obstétrique*, November, 1892.

September, and suckling may be prolonged to avoid this. As to the rule suggested by some that the earlier or later appearance of the teeth may be taken as a guide towards lengthening or shortening lactation, we must bear in mind that lateness of teething may be a sign of rickets, and that a poor quality of the milk may be a cause of this, especially when associated with too prolonged suckling.

Reasons for Anticipating the Usual Time of Weaning.—Should the mother begin to lose weight and to suffer from languor, depression, backache, pain in the side, headache, loss of memory, dizziness, palpitation, anæmia, &c., these are symptoms of **hyperlactation** (over-suckling). If menstruation have become established and the loss be great, if the breasts be badly inflamed with abscess formation, if the mother have acquired acute disease or become pregnant again, suckling should cease. If she have epilepsy, insanity, phthisis, or alcoholism, she should not be allowed to suckle at all.

Again, if the infant be not thriving, as tested by weighings, or if there be signs of the development of rickets, on account of the poor nutritive value of the mother's milk, weaning may be indicated. At the same time it is important not to wean on too slight provocation, as some of the above symptoms in the mother may be due to temporary causes, and may be relieved in a day or two.

Weaning.—It may be necessary to wean suddenly, on account of the condition of the mother's health, or because, as occasionally happens, the infant steadily refuses all artificial food while it can obtain breast milk. The strength of purpose shown by an infant under such circumstances is sometimes extraordinary.

Weaning is, however, best accomplished gradually, for in this way the stomach is best trained to its new diet, and if the stomach be upset the natural feeding can be resumed for a time. Moreover, the gradual process is easier for the mother.

It has been recommended that weaning should occupy one month, and be conducted in the following way :—

First week	feed	naturally	6	times, and	artificially	once	per day.
Second	,,	,,	5	,,	,,	twice	,,
Third	,,	,,	3	,,	,,	4 times	,,
Fourth	,,	,,	1	,,	,,	6 times	,,

The consideration of the diet for supplemental feeding, and for feeding after weaning, forms part of the whole question of artificial feeding which we proceed to consider.

II. ARTIFICIAL FEEDING.

Human milk is the type of a perfect food. It contains all the requisite elements in due proportion. The problem of artificial feeding lies in a nutshell. It is to provide a food which shall correspond as closely as possible to this, the natural diet of infancy.

In the absence of human milk, **cow's milk** is the staple diet of infancy in the immense majority of cases. Let us consider first the use of cow's milk, and inquire how cow's milk differs from human milk, and how it can be made to resemble it.

The following table shows the comparative composition of the two :—

Reaction.	Sound Dairy Milk. Feebly Acid.		Human Milk. Persistently Alkaline.	
Specific gravity, .	1·0297		1·0313	
	Extremes.	Average.	Extremes.	Average.
Fat (cream), .	3 to 6	3·75	2 to 7	4·13
Milk sugar, . .	3·5 ,, 5·5	4·42	5·4 ,, 7·9	7·0
Proteids, . .	3 ,, 6	3·76	0·85 ,, 4·86	2·0
Mineral matter, .	0·6 ,, 0·9	0·68	0·13 ,, 0·37	0·2

The results of various observations vary. This table is taken from an article by Dr. A. R. Leeds in Starr's American *Text-book of the Diseases of Children,* 1901, "On the Chemistry of Milk and of Artificial Foods for Children." The author acknowledges the use he has made of this able article in preparing this section.

These differences in composition may be shown in a graphic manner by means of the diagram on next page.

The most important point to note is that in cow's milk the albuminous matters (or proteids) are on the average one and three-quarter times as much again as in human milk. Now, the albuminous material is of two kinds, the part which forms curd and which is called *casein,* and the part which will not form curd and which is called *lact-albumen.* In cow's milk about four-fifths of the albuminous matter will clot or form curd during digestion, but in human milk only about one-half. Taking equal weights of the two kinds of milk, cow's milk yields about four times as much clot as human milk (*Leeds*).

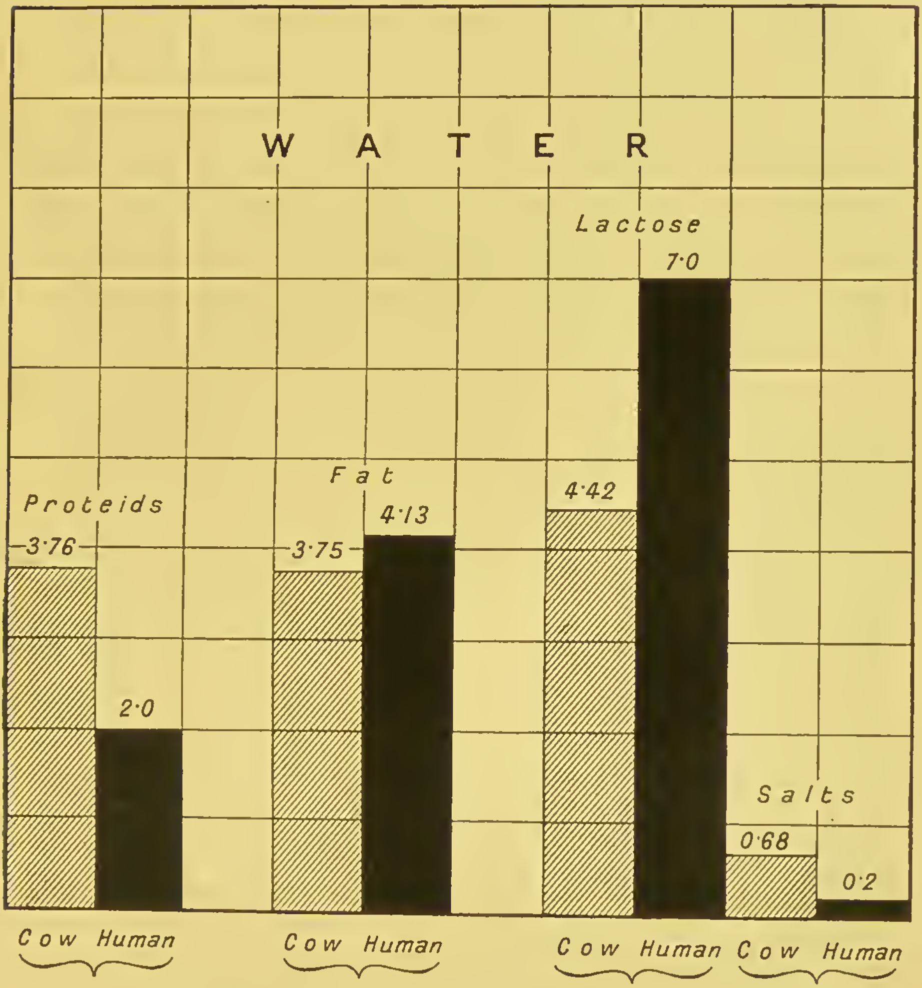

Fig. 15.—Diagram to show relative composition of cow's milk and human milk.

This is the principal cause of the difficulty experienced in feeding infants on cow's milk; in other words, cow's milk contains too much cheese.

The analysis of human milk here given shows the essential

constituents of a perfect diet for infants, and the proportion in which they should be present.

. That is to say, the diet must contain—

Nitrogenous or albuminous material (casein and lact-albumen).
Carbohydrate or saccharine or starchy material (lactose or milk sugar).
Hydrocarbons or fats (cream).
Salts or mineral matter.
Water.

In fresh milk there is present another element, which does not appear in this analysis, and that is the **antiscorbutic** or scurvy-preventing agent. If in an infant's diet any one of the above be wanting, or deficient in amount, the child will not thrive. Hence in prescribing diet for infants we must always see that these elements are present in due proportion, and in dealing with those who are not thriving properly, we must always determine whether any one of these is deficient or absent.

For example, **nitrogenous** material is perhaps the most important element in diet. Healthy vigorous development is impossible without it. But if a child should vomit all the curd of the milk, and if we were to substitute for milk a non-nitrogenous diet (as, for instance, some form of farinaceous food), the child would not thrive.

The **fatty** element is only second in importance to the nitrogenous. Fat forms a much larger proportion of the diet required in infancy than of the diet of adult life. It is estimated that an adult needs in twenty-four hours 56 grammes of fat, and that an infant in the same period needs from 30 to 45 grammes—*i.e.*, from a half to three-quarters as much as the adult. Starve the child of fat and it will not thrive.

When the milk is poor in cream, or when milk is abandoned, and the child is fed on farinaceous food, this is demonstrated practically. Fat-starvation is one potent cause of rickets.

The Carbohydrates.—Sugar and starch-containing food are essential to infant nutrition, but the mistake of omitting these from the diet is not likely to be made. The popular error is on the other side, namely, to give too much, and to give it too early.

Mineral matters are also essential, but milk, farinaceous food, and meat juice all contain these. Iron and lime salts have sometimes to be given medicinally. Table salt must not be forgotten in artificial feeding. Of the antiscorbutic element we speak elsewhere, but it is important to remember that farinaceous foods are not antiscorbutic.

Measuring Food.—Nurses are strongly advised not to use tablespoons and teaspoons to measure food with, because of the extreme variation between the quantity which different spoons will contain. Glass measures marked in fluid drachms and ounces should be employed. One tablespoonful should always mean half a fluid ounce and a teaspoonful one fluid drachm.

ON FEEDING INFANTS WITH COW'S MILK.

The food for infants who have to be fed artificially instead of by the breast is cow's milk. An unlimited number of "infants' foods" are widely advertised, but they are at the best but temporary substitutes for cow's milk. Undiluted milk, however, cannot be digested well by young infants, because the excess of casein causes indigestible masses of curd to form in the stomach and appear in the motions, and vomiting and diarrhœa follow. Hence, for infant feeding, milk requires to be **modified.**[*]

Milk is said to be "**humanised**" when its composition is altered by dilution and the addition of cream and sugar, so as to make it approximate to that of human milk. But it is not best to take one formula and use that throughout the whole of the first six months or more, but to vary the proportion of the principal ingredients according to the age and digestive powers of the individual infant. This is called "**modifying**" the milk.

Dilution of Milk.—The use of this is to reduce the proportion of casein. It has the further benefit that in diluted milk the curd is lighter, more flocculent, and more digestible.

Plain water may be used, but *barley water* is very useful for this purpose, and has a slight nutritive value.

Preparation of Barley Water:—For young infants—Take two teaspoonfuls of well-washed pearl barley and 1 pint of water. Boil slowly in a saucepan for one hour, then strain. It should now measure about $\frac{2}{3}$ pint. When the child is six months old, it may be made much thicker.

---

[*] This statement is in accordance with the almost universal teaching and experience of the medical profession in England and America and the Continent of Europe. It ought to be said, however, that Budin and his school declare that infants *can* digest undiluted sterilised cow's milk. On this we will only say that not all Paris infancy specialists agree with this, and that the French physicians make great use of wet nurses, on whom they can fall back when the infant cannot take artificial food. They conduct their infant-feeding with very careful weighings to control the diet. They use very pure milk, and the better and newer the milk, the less trouble is there in feeding infants. Our conviction is that the best system lies somewhere between this giving of undiluted milk on the one hand, and the extreme elaboration of the *percentage* method on the other.

Limewater is useful as a diluent, preventing dense curding, and helping to give to cow's milk the alkaline or neutral reaction of human milk.* It contains ½ grain of lime to the ounce, and ½ grain of lime is required for each ounce of milk used. In later infancy, when less dilution is required, one may use the saccharated solution of lime, which contains 1 grain in 67½ minims, or rather more than a grain in a teaspoonful. Limewater also helps to supply the mineral constituents of bone. **Oatmeal** water may also be used, made in the same way as barley water, and this is serviceable when the child is constipated. In a similar way **rice** water may be used, and this is indicated when the bowels are relaxed.

Albumen water is used for dilution in very young infants, and in those whose digestion is weak.

Take 1 ounce of raw white of egg, cut in various directions with a clean pair of scissors, which should first be dipped in boiling water; shake well with a pint of water, and strain. This must not be boiled, or the albumen will be coagulated. Contains not quite 1 per cent. of albumen (proteid).

If milk be diluted, an infant in the first month can usually take 1 part milk and 2 parts water; and, supposing that the proportion be gradually altered, it will at the third and fourth month take half milk and half water, and at the sixth month 2 parts milk and 1 part water. After nine months it will take nearly all pure milk, but a little dilution helps the digestion of the milk, and should be continued.

A very large number of infants have thriven well on such milk modified by dilution alone, but a glance at Fig. 15, on p. 83, will show that, if cow's milk be diluted till the proteid content does not exceed that of human milk, the fat and the sugar will be much below the proper proportion, and, in fact, such diluted milk is especially poor in fat, even if the milk be not already wanting in this respect before dilution. Therefore, for scientific modification, we need **addition of cream and sugar.**

Cream.—Ordinary cream, obtained by skimming milk after standing, contains 12 to 16 per cent. of fat, and is called "**gravitation" cream.** If milk be allowed to stand as described on p. 46, in five or six hours the *upper third*, removed by spoon or siphon, will contain about 10 per cent. fat, and is called **top milk,** while the *upper half* thus removed will contain 7 to 8 per cent. fat.

---

* Bicarbonate of soda is also used for the same purpose, in the proportion of 20 grains to the pint.

Separated centrifugal cream will contain as much as 45 to 48 per cent. of fat.*

Sugar.—To humanise milk, the sugar added should be **lactose**, or milk sugar. This is not so sweet as cane sugar. Unfortunately lactose costs from 1s. 6d. to 1s. 9d. per pound, whilst lump sugar costs about 2½d.

When cane sugar is substituted for lactose, only about two-thirds the quantity is needed. It is very nearly as good.

We have now to consider how the modification of milk according to the principles just explained can be carried out, and especially how this can be done amongst the poorer classes, where wrong feeding is so common. For these it is of no use to prescribe any system that is complicated or costly, or difficult to carry out in a cottage dwelling.

FIRST METHOD.—This is the cheapest and simplest, consisting of dilution with addition of sugar, and is to be used when the parents cannot afford to buy extra cream.

The following directions are taken, with slight alterations, from the leaflet issued by the borough of Finsbury:—

How to Feed a Baby Artificially from Birth.—If the mother cannot suckle her child, it should be fed on cow's milk and water, or cow's milk and barley water, with a little sugar added, as directed below. Skimmed milk should not be used. It is best to boil the milk, especially in summer.

The whole quantity of food for the day should be prepared in the morning, as directed below. It must be kept in a cool place out of the dust. The best way is to put it in a corked bottle or covered jug, and stand this in cold water.

During the First Fortnight.—Boil together ¼ pint of fresh milk, ½ pint of water, and a small tablespoonful of sugar. Three tablespoonfuls of this should be warmed up and given every two hours during the day, and twice during the night.

Between Two Weeks and Two Months.—Boil together ½ pint of milk, ¾ pint of water, and a tablespoonful of sugar. Five tablespoonfuls should be given every two hours during the day, and twice during the night.

During the Third and Fourth Months.—Boil together ¾ pint of milk, ¾ pint of water, and a tablespoonful of sugar. Eight tablespoonfuls to be given every two and a half or three hours during the day, and once or twice during the night.

During the Fifth Month.—Boil together 1 pint of milk, with

---

* If equal parts of ordinary cream and ordinary milk be mixed, milk containing 10 per cent. fat is produced; and if one part ordinary cream be mixed with three parts milk, a milk with 7 per cent. fat is produced.

¾ pint of water and a tablespoonful of sugar. Ten tablespoonfuls to be given every three hours during the day, and once during the night.

During the Sixth to the Ninth Month.—Boil together 1¼ pints of milk (sixth month), or 1½ pints (seventh to ninth month), with ¾ pint water and a tablespoonful of sugar. Eleven to twelve tablespoonfuls to be given every three hours during the day. The child should not be fed at night.

These directions, simple as they are, need to be enforced by verbal explanation, together with other points to be mentioned hereafter.

If the mother can add but a little cream to each feed, the diet will be much better.

SECOND METHOD.—The following is taken from a leaflet which is in use at the three principal medical charities in Leeds. Although not an ideal method, it is simple and practicable, and is adapted for the classes who avail themselves of the out-patient departments, and who are able to provide the necessary cream, and this includes more mothers than one might at first expect. It will be seen that a certain " milk-mixture " has to be prepared each day, in quantity sufficient for the day. Here also reiterated instruction greatly helps success.*

" 1. As soon as the milk is obtained, prepare the 'milk-" mixture' for the day as follows:—Boil for 1 minute, then " cool rapidly, and add to each pint 8 tablespoonfuls of fresh " skimmed cream (or, better still, 2 tablespoonfuls of separated " cream) and 4 level tablespoonfuls of white sugar (or, better, " milk sugar—of any chemist). Then cover it up, and stand " in a cool place."

" 2. Add to each feed, just before giving it, the proper quantity " of barley-water (or limewater) shown in the table."

" 3. When the feed is made, warm before using."

See *Table on opposite page.*

In England the majority of infants who are reared artificially are fed in accordance with the general principles hitherto laid down, care being taken to watch the child's progress, and modify the diet as required in each case, but without any elaborate system of modification.

In America, to a large extent, and in this country to a very limited extent, the so-called **percentage system** is in use. On this system the physician writes a prescription for each infant, stating the percentage of proteid, fat, and sugar desired, with the quantity to be sent in so many bottles, and there are dairy

---

* The leaflet is given in full in Appendix II.

TABLE FOR SECOND METHOD.

	By Day.	By Night.	Quantity.
1st month	Every 2 hours	2 feeds	1½ tablespoonfuls of milk-mixture with 2½ tablespoonfuls of barley- or lime-water.
2nd month	Every 2½ hours	2 feeds	2 tablespoonfuls of milk-mixture with 3 tablespoonfuls of barley- or lime-water.
3rd month	Every 3 hours	2 feeds	2½ tablespoonfuls of milk-mixture with 3½ tablespoonfuls of barley- or lime-water.
4th month	Every 3 hours	1 or 2 feeds	3 tablespoonfuls of milk-mixture with 4 tablespoonfuls of barley- or lime-water.
5th month	Every 3 hours	1 feed	4 tablespoonfuls of milk-mixture with 5 tablespoonfuls of barley- or lime-water.
Now cease night feeding altogether.			
6th and 7th months	Every 3 hours (6 feeds daily)	Nothing	7 or 8 tablespoonfuls of milk-mixture with 4 tablespoonfuls of barley- or lime-water.
8th and 9th months	5 meals a day	Nothing	11 or 12 tablespoonfuls of milk-mixture with 4 tablespoonfuls of barley- or lime-water. 2 meals may have a little baked flour or rusks added.

laboratories in all American cities, where the milk will be supplied, sterilised, Pasteurised, or untreated as specified. In London the Walker-Gordon Laboratory, 7 Duke Street, W., will supply a table showing the percentage of ingredients that has been found suitable for the average child, and will dispense the prescription on the American plan. A very small proportion of English practitioners can avail themselves of such institutions. They save trouble, but involve expense, and mean the handing over to others the care and preparation of the infant's food in a way that is not altogether desirable. Some American text-books contain mathematical formulæ for calculating percentage modification. With care and scrupulous cleanliness, however, a system of modification can be carried out at home which, without involving much calculation or minute variation in proportions, serves as a useful guide to the progressive adaptation of cow's milk to the diet of the growing infant.

The best and simplest of such methods seems to us to be that designed by Dr. Emmett Holt, and described by him in full detail in a little catechism for mothers and nurses, which will be found very useful in many ways in the nursery.*

THIRD METHOD—Progressive Modification of Milk. —*Holt's Formulæ.*—Ten formulæ are given containing the same elements in varying proportions. It will be seen that the amount of milk with definite percentage of fat increases 1 ounce at a time. For the first five formulæ 10 per cent. milk is used, and for the second five 7 per cent milk, for which see p. 87.

Formula, ...	I.	II.	III.	IV.	V.
	ozs.	ozs.	ozs.	ozs.	ozs.
10 per cent. milk, . . .	2	3	4	5	6
Milk sugar, ...	1	1	1	1	1
Limewater, ...	1	1	1	1	1
Boiled water, ...	17	16	15	14	13
Total,† when sugar has dissolved,	20	20	20	20	20

Formula, ...	VI.	VII.	VIII.	IX.	X.
	ozs.	ozs.	ozs.	ozs.	ozs.
7 per cent. milk, ...	7	8	9	10	11
Milk sugar, ...	1	1	1	¾	¾
Limewater, ...	1	1	1	1	1
Boiled water, ...	12	11	10	9	8
Total, when sugar has dissolved, .	20	20	20	20	20

---

* *The Care and Feeding of Children*, by L. Emmett Holt. London, S. Appleton. Price, 2s. Those who may wish to carry out the percentage system more elaborately may consult Dr. Eric Pritchard's work on *The Physiological Feeding of Infants* (Kimpton).

† These mixtures will each measure 20 fluid ozs. when the sugar has dissolved.

It is not possible to say exactly for what age each formula is suited, because there are such variations in different individuals, so that two children, one of whom is several weeks older than the other, may require the same preparation. Hence, if such a table were given, its accuracy would be only apparent. As a general guide, it may be said that I. is for the new-born child from the beginning of feeding on the second day. On the fourth day change to II. From the seventh to the tenth, change to III. A strong child may advance to V. at the end of the first month, but a weak child not till the middle or end of the third month. VI. to X. cover the period up to the ninth month. The changes will run somewhat as follows:—Third month, VI.; three and a half months, VII.; fourth month, VIII.; fifth and sixth months, IX.; seventh, eighth, and ninth months, X.

In all cases increase should be cautious, and, so long as the child is satisfied and gains weight satisfactorily, there will be no great need to increase the strength or amount of the food. Over-feeding is a far more serious danger than under-feeding. The latter is easily rectified, the former may upset the child for a long period.

In the formulæ the amount is given to make a pint, but it will be easy to prepare larger quantities, as required, with the same proportions.

Frequency of Feeding and Quantity Taken in Twenty-four Hours in the First Year.—No absolute rule can be laid down, averages can be quoted, but to attempt to adhere rigidly to them would cause harm, especially in the over-feeding of infants of light weight or feeble constitution. The following table is, therefore, only a rough guide:—

Age.	Number of Feedings.		No. of Ounces per Meal.	Total in Ounces.
	Day.	Night.		
First week, ...	8	2	1 to 1½	10 to 15
Second week to fourth week,	8	2	1½ ,, 3	12 ,, 24
Fourth ,, sixth ,,	7	1 or 2	2½ ,, 3½	20 ,, 28
Sixth ,, third month,	7	1	3 ,, 4	24 ,, 32
Third month to fifth ,,	6	1	4 ,, 5	28 ,, 35
Sixth ,, ninth ,,	6	0	5 ,, 7	30 ,, 42
Ninth ,, twelfth ,,	5	0	7 ,, 9	35 ,, 45

After ninth month the meals may be supplemented as stated on p. 106.

Difficulties with Milk Feeding.—It is a very common thing to meet with children who are being artificially fed who vomit everything given to them, or whose motions contain large masses of undigested curd. In many such cases they have been upset by over-feeding or by wrong feeding, and it is then sometimes a most difficult problem to find anything that they can take. To reduce the quantity of food and to increase the dilution of the milk is the first expedient, but, if nothing more be done than this, the child may fail to gain weight because the diet is too poor.

One good plan is to avoid curd altogether for a while, as a temporary expedient, till the child can digest better.

A mixture of cream and sugar, with albumen water, is a good prescription under these circumstances:—

Take of Cream, 4 ounces.
Milk sugar or white sugar, ½ ounce.
Albumen water, 12 ounces.

Another excellent plan for feeding young and delicate infants is **milk humanised by precipitating part of the curd**:—"Heat half a pint of skimmed milk to 96° F.—that is, just warm—and well stir into the warmed milk a given measure full of Walden's extract of rennet. When it is set, break up the curd quite small, and let it stand for ten to fifteen minutes, when the curd will sink. Carefully separate the curd, place the whey in a saucepan, and boil it quickly. When quite cold, add two-thirds of a pint of new milk to the strained whey, and two teaspoonfuls of cream, well stirring the whole together. If during the first month the milk be too rich, use rather more than one-third of a pint of whey" (taken from Playfair's *Midwifery*).

There is more than one satisfactory preparation of rennet in the market, such, for instance, as Warren's "Sweet Essence of Rennet," and others. The quantity directed to be used is about two teaspoonfuls to a pint, a little more or less affecting only the time necessary for complete coagulation. It is very important not to allow the temperature to exceed blood-heat, because the curdling power of the rennet would then be damaged. Hence the use of a thermometer is indicated.

If the cost of the essence of rennet be a consideration, we may put into the skimmed milk a piece of rennet about 1 inch square. This must be removed as soon as coagulation begins, and the same piece of rennet, says Playfair, may be employed daily for a month or two.

We can speak from much experience of the utility of this plan.

Another valuable temporary food for infants and invalids is peptonised milk—that is, predigested milk.

How to Peptonise Milk.—For this purpose we may employ the Liquor pancreaticus (Benger) as recommended by Sir W. Roberts. These are Roberts' directions:—Fresh milk is diluted with water in the proportion of 3 parts milk to 1 part of water, and a pint of this mixture is heated to boiling, and then poured into a covered jug. When it has cooled down to between 140° and 150° F., 3 teaspoonfuls of Liquor pancreaticus and 20 grains of bicarbonate of soda are mixed therewith. The jug is then placed under a cosey in a warm situation for an hour. At the end of this time, the further action of the ferment is checked by boiling for two minutes. If the ferment acts too long the milk becomes unpleasantly bitter. In fact, children may dislike the taste of the peptonised milk and refuse it. In this case the difficulty may be surmounted by peptonising condensed milk. Peptonised condensed milk may be bought ready made.

Dr. Leeds advises the use of the "peptogenic milk powder," made by Fairchild & Foster, of New York, and he recommends the following mixture as furnishing a sterilised and partly predigested humanised milk:—

Take of milk, $\frac{1}{2}$ pint.
Water, $\frac{1}{2}$ pint.
Cream, 4 tablespoonfuls.
Peptogenic milk powder, one large measure.
(The measure is supplied with the powder.)

Heat this on a gas stove or hot range gradually, with constant stirring, so that it shall boil in about ten minutes. It is then ready for use.

Predigested milk is an excellent temporary food, and when we have to deal with an infant who vomits almost everything that is given to it, and with whom nothing seems to agree, some form of predigested food may be invaluable, and may be continued till the child regains the power of healthy digestion; but such food is not to be recommended for the regular diet of healthy children. It is far better that the stomach should develop its own proper functions, and not have to depend on outside help. Hence when peptonised milk is employed the amount of predigestion may be gradually diminished, and the process discontinued as soon as possible. A continuous diet of peptonised condensed milk exclusively may cause scurvy (*Cheadle*).

Condensed milk is in extensive popular use for infant feeding, and sometimes agrees when ordinary milk disagrees. Its advantages for readiness of preparation, for use when travelling, or when the supply of cow's milk is defective, are obvious. There are two varieties of condensed milk. The one is made by simple concentration of milk, and preparation by hermetically sealing it, the other by concentration, with the addition of cane sugar. The latter keeps much the better. Condensed milk, of course, requires dilution for use; each tin contains directions for this. For instance, Nestlé's milk is to be diluted in the proportion of 1 to 4, or 1 to 5. For infant feeding it would require still further reduction to $\frac{1}{2}$ or $\frac{1}{3}$ weaker, making a total dilution of from 1 in 8 to 1 in 15. For very young infants it is better to begin with still greater dilution, and to cautiously increase the strength. It has been said that condensed milk digests better than uncondensed cow's milk. Dr. Leeds denies this, and says that the fallacy has arisen because condensed milk is always given freely diluted.

It is found that children fed for a long time almost exclusively on condensed milk grow fat, flabby, and unhealthy, and the excess of sugar causing fermentation upsets the digestion. Some varieties of condensed milk are deficient in fat, which ought to be present to the amount of about 12 per cent. Although condensed milk is sometimes a very valuable article of diet where good cow's milk is not obtainable the return to cow's milk should always be aimed at. Samples of condensed milk have sometimes been found not properly sterile, and its deficiency in antiscorbutic power has been already mentioned.

Milk preserved by chemical agents must be absolutely rejected.

Artificial Milk Foods.—Artificial food and proprietary preparations though extensively used are not to be regarded as desirable substitutes for fresh milk. In feeding infants we cannot say too emphatically breast milk first, and exclusively if possible; next, breast milk supplemented by cow's milk modified; failing that modified cow's milk. It is only when this cannot be obtained, or the child vomits, or cannot digest it that we may use, as a temporary expedient, some one or other of the patent foods which are designed to resemble human milk as closely as possible. These dried foods are likely to be deficient in fat and in the scurvy preventing element, but sometimes they are digested a little better than ordinary milk and so come to our help in certain cases. No child should be fed permanently out of "tins." Allen and Hanbury's No. 1 is a good specimen of this class, and so is Horlick's malted milk. The use of some other kinds of patent foods will be discussed later.

On the Sterilisation and Pasteurisation of Milk.—We have already discussed the indications for these. It is best to sterilise in bottles which contain enough for a single meal, and to seal them hermetically. The bottle is then kept till the time for use, when it is warmed and fitted with a teat, and the child is fed direct from the bottle. The sterilised milk can be purchased ready prepared in the depôts, or sterilised in the house in an apparatus designed for the purpose, of which that of Soxhlet* is a good example. Of this we will now give a description, with an abstract of the directions for use issued with the steriliser.

Soxhlet's steriliser consists of—(1) A number of thin glass flasks which can stand the temperature of boiling water (AA); (2) a large covered pan in which they can be surrounded with water and boiled (B); (3) a holder for lifting the flasks into and out of the pan (C); (4) a rack to hold the flasks when empty (D); (5) a small vessel in which a single flask can be warmed for use (E); (6) a graduated jug for diluting the milk according to measure (G); (7) indiarubber discs for closing the flasks (F); (8) metal caps to hold the discs in place; (9) teats to fit flasks (H); and (10) a brush for cleaning (J).

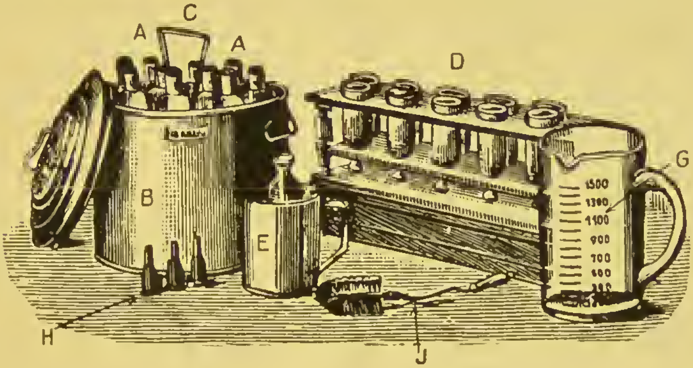

Fig. 16.—Soxhlet's steriliser.

Directions for Use.—1. The milk employed must be as fresh as possible, and should be a mixture of the milk of several cows. If the physician has ordered the milk to be modified, this must be done before heating.

2. The flasks should be filled with a quantity sufficient for

---

* Prof. Dr. Soxhlet's *Neuer Steriliser-apparat für Kinder-milch* is sold by Gerhard Dressler in Leipzig, Tauchaer Strasse, 24, and Metzler & Co. in Munich. Messrs. Maw, Son & Thompson, Aldersgate St., London, act as the agents here.

one day's use. The contents of ten flasks, each holding 150 grammes, will amount to 1½ litres, and this amount of diluted or undiluted milk is more than sufficient for the normal nutrition of an infant for one day. Overfeeding is to be specially avoided.

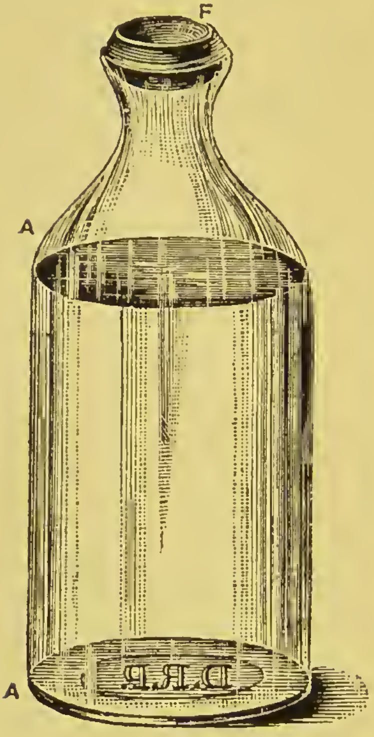

Fig. 16*a*.—Sterilised flask with disc in position showing concavity caused by atmospheric pressure.

3. The flasks being arranged upon the holder, an indiarubber disc is placed upon the mouth of each, and the metal cap is put over the disc. The pan is filled with cold water until the water in the pan stands level with the milk in the flasks. The pan lid is put firmly on, and the whole is heated to boiling point on a stove, but not in a closed oven.

4. After the water has boiled briskly for three-quarters of an hour, the steam escaping all the time from the edge of the lid, the lid is removed and the flask holder lifted out. As the flasks cool, the atmospheric pressure, acting on the discs, seals the flasks hermetically.

5. For use one flask is warmed to blood heat in the small vessel, a process which frequent shaking facilitates. When the flask feels neither hot nor cold when laid upon the eyelid, it is ready for use. The disc is then removed by tilting up one edge, the teat is applied to the flask, and the *child fed directly from it.*

6. So long as the discs remain depressed, the flasks are fit for use. When one has been opened, any unused remnant must be thrown away; but a closed flask will keep two or three days.

7. After use, the flasks must be at once filled with water, so that no drop of milk can dry upon the interior. They must be cleaned with the brush, and some alkaline carbonate may be used for the purpose. The discs also must be thoroughly washed in water, and they last longer if every four weeks they are boiled in soda solution.

Pasteurisation.—There is a modified process of milk sterilis-

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

ation called *Pasteurisation*, which is advocated by some. This consists in heating the milk to from 160° to 170° F. for ten or twenty minutes. This heat does not coagulate the lact-albumen. It is sufficient to destroy the germs of tuberculosis, scarlet fever, typhoid, and pneumonia, and to inhibit the development of bacteria, although it does not actually destroy spores as the higher temperature does. This alters the taste of the milk less than the other process. If it be wished to keep the milk longer than twenty-four hours, especially in hot weather, the higher temperature is more effective (*Rotch*). To Pasteurise with Soxhlet's apparatus, only an inch or so of water is put in the vessel, and the boiling is continued twenty minutes, with the lid loosely fitted on.

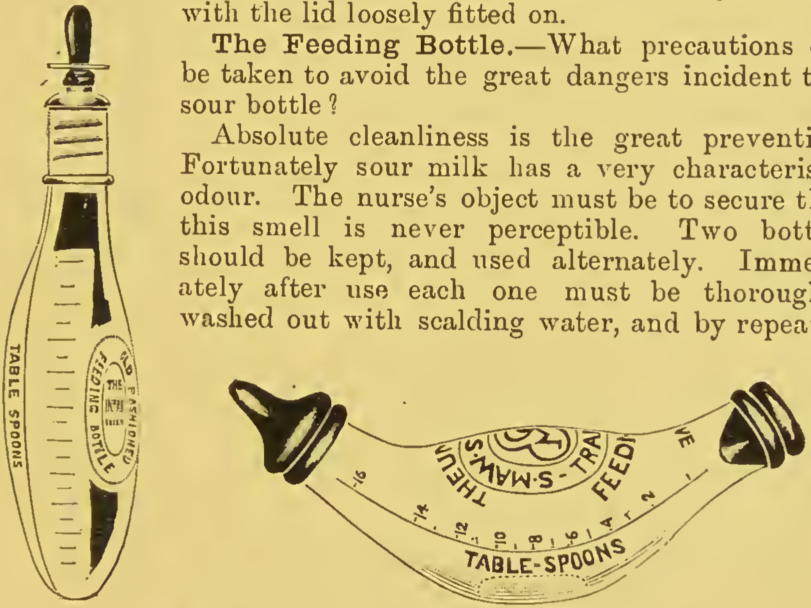

Fig. 17.—Good patterns of feeding bottles.

The Feeding Bottle.—What precautions can be taken to avoid the great dangers incident to a sour bottle?

Absolute cleanliness is the great preventive. Fortunately sour milk has a very characteristic odour. The nurse's object must be to secure that this smell is never perceptible. Two bottles should be kept, and used alternately. Immediately after use each one must be thoroughly washed out with scalding water, and by repeated rinsing under the tap; a clean bottle brush and some Hudson's dry soap may be used in the process, and care must be taken not to let a drop of milk dry up in the bottle. When thoroughly clean, it may be left to soak in a solution of Condy's Fluid (2 drachms to the pint), or of boracic acid (saturated), and the bottle be washed after removal from these solutions; no odour or taste will remain.

The greatest difficulty is presented by corks or stoppers, and by anything which can harbour germs. The feeding bottle with the indiarubber tube is very difficult to keep sweet, and should never be used. The old-fashioned, boat-shaped bottle, with a simple teat over the mouth, is much the best. It has to be held to the child's mouth; but this is an advantage over the other system, for the bottle is removed from the lips when empty, so the child does not go on sucking air from an empty vessel. The bottle may also be made pear-shaped, with a flat bottom, and it may with advantage be graduated in fluid ounces and half ounces. The teats must be conical and made of soft indiarubber, so that they can be easily turned inside out for cleaning. These are carefully washed inside and out after each cleaning, and kept in the boracic acid solution when not in use. They must be frequently renewed. The apertures in the teat should be large enough to allow a free flow of milk on suckling, but not large enough to allow the milk to flow by the simple force of gravity.

A new form of bottle with a very large teat, equalling in size the human nipple and areola, has recently been introduced into this country from America. The child seems to be able to suckle better with a nipple which it can take into the mouth as it does that of the mother. This nipple is also especially easy to clean. A sketch of this is given in Fig. 17*a*.*

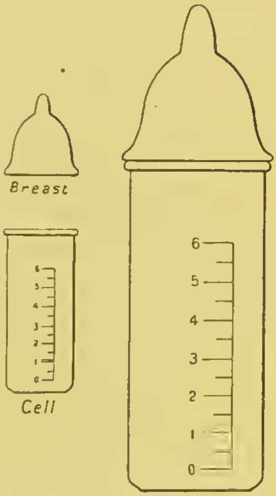

Fig. 17*a*.—The Hygeia nursing bottle, made by Hygeia Nursing Bottle Co., Buffalo, N. Y.

On the Use of Farinaceous Foods in Early Infancy.—The flour of various cereals—of wheat, oats, maize, lentils, &c.—in the form of baked flour, bread, biscuits, &c., together with arrowroot, rice, sago, tapioca, form a class of foods which, next to milk, constitute the staple diet of infancy after the normal time of weaning; but, inasmuch as all these foods contain more or less starch, it follows from what has been already said that their use is to be avoided during the first six months of life, lest the digestive organs be upset, and the intestines filled with undigested fermenting products. It may be taken as a general rule that no starch should be given for the first six months of infancy. One of the commonest mistakes in feeding infants is to give them such food in the earlier months in the form of bread and milk or "pobs," or some patent baby's food of the same nature.

---

* This bottle can be obtained from R. Darney & Co., 56 Great Queen Street, London, W.C.

Foods containing Predigested Starch.—The natural digestion of starch can be imitated outside the body by the action of malt. If malt meal be mixed with wheat meal, and kept at a certain temperature, the starch turns into glucose (or grape sugar), and the infant's stomach can digest it long before ordinary starch. There are on the market to-day many such "malted foods," and advertisements recommending them are found everywhere, often exhibiting pictures of living skeletons changed into plump babies by the use of the food in question. To use such foods as a substitute for pure milk is a great mistake, and is apt to cause infant scurvy. They were formerly prescribed to be added in small quantity to modified milk from the fourth month onward, but they should have no place in the feeding of early infancy, except as temporary expedients used under medical direction.

Foods Available for Use after Weaning at Normal Times.—Pure milk remains the great essential, and after nine months very little dilution is needed.

Use of Farinaceous Foods after Weaning.—The following are some of the ways in which these can be administered:—

Wheaten Flour—Baked.—A valuable and popular food; it may also be used as a supplementary diet after six months. It is baked in an oven until it is light brown, then reduced to fine powder with a rolling pin, and is administered with a due proportion of milk. All flours are baked before use in order to cause partial conversion of the starch.

Entire wheat flour (Chapman's) is rich in phosphates and nitrogenous matter, is very useful after weaning, and is a good diet to recommend for rickety children.

Flour Ball.—This is a preparation recommended by Eustace Smith and others, and said to agree especially well from six months onwards. Take a pound of pure wheat flour and tie it up very tightly in a pudding cloth. Boil for ten hours in water; at the end of this time there is produced a yellowish-white ball. When cold, the softer outer coating is cut off, and the hard core is grated to a fine powder. A child of six months can take in twenty-four hours two teaspoonfuls or less of this food. It is given twice in the day. A teaspoonful of the powder is made into a smooth cream with a little milk, and is then mixed carefully with a quarter of a pint of boiling milk poured slowly upon it with constant stirring.*

Wheaten bread can be used early if properly prepared.

---

* Eustace Smith, *Wasting Diseases of Children.*

Churchill's bread jelly is perhaps the form in which it can be used first. It involves some trouble in preparing, but it is useful in feeding infants who vomit ordinary milk.

Mode of Preparing Bread Jelly.—Take 4 ozs. of stale bread. Soak in cold water eight hours, then squeeze out the water, and boil the pulp in a pint of fresh water for one hour and a-half. Strain and rub through a fine hair sieve the thick gruel thus obtained, and allow it to cool into jelly. For use, mix one teaspoonful of jelly with 8 ozs. of previously boiled water, making a thin cream-like fluid, and add a little white sugar. The jelly keeps badly, and must be made night and morning. In this process the starch is partly changed to dextrine and grape sugar. Dr. Cheadle has shown that an admirable substitute for cow's milk can be made by preparing a mixture of 1 part bread jelly, and 8 parts water, 3 parts raw meat juice, and one pint cream, with a little sugar.

Bread and Milk for an Infant at Six Months (Chavasse).—Boil the crumbs of bread for two hours in water, taking care to avoid burning, add a little sugar, and a little boiling milk. The proportion of milk to be increased according to age.

Another Plan.—Cut thin slices of bread into a basin, cover the bread with cold water, place it in an oven for two hours to bake. Then remove it and beat up the bread with a fork, and slightly sweeten it. (Milk or cream to be added.)

In very common use are rusks, "tops and bottoms" and other similar manufactured biscuit foods. They need thorough soaking and softening in boiling water. Then beat to a pulp with a fork and strain off water. Add previously boiled milk, or milk and water, and stir to thin uniform consistence.

Oatmeal.—It is useful to mix this with wheaten flour before baking. It is laxative in its tendency, and helps to correct the occasional constipating effect of ordinary baked flour.

Oatmeal Gruel may be used to dilute milk, in the same way as barley water.

Barley.—Barley meal is very nutritious, and is largely used in fattening animals. Malt and maltine play a large part in modern therapeutics; but barley itself is not much used for infant diet, except in the form of barley water, which is only slightly nutritious (see p. 85).

Dr. Eustace Smith includes pearl barley jelly in the dietary for infants of about ten months and onward.

Pearl barley boiled for six hours forms on cooling, after the water has been strained off, a jelly which dissolves readily in warm milk.

Maize or Indian Corn, sold as "corn flour," of which Messrs. Brown & Polson make a reliable preparation. Useful as a variety in diet in second year of age. Is decidedly nutritious, and comparatively rich in fatty matter.

Lentil Flour is nutritious, and is relatively rich in nitrogenous matter. It is sold under the name of Revalenta, and is, as a rule, well taken by infants.

Arrowroot, Rice, Sago, Tapioca, Tous-les-mois.—These contain a large proportion of starch. They are not suitable for staple diet, even when the powers of digesting starch are established; but they are very useful adjuncts to the diet in the second year of life and onward.

Arrowroot, however, can sometimes be taken well by infants with delicate stomachs, and with tendency to diarrhœa. It is made with boiling water and added to the milk.

The *potato* is very rich in starch, and has antiscorbutic virtues. Potatoes well mashed, and given with gravy, are useful in the dietary of the second year, or even at the end of the first. Dr. Cheadle advises a gruel made from potato pulp for the treatment of scurvy.

Meat.—Ordinary meat, cut up with the knife, is not suitable for children until their teeth are all cut, and therefore hardly comes into the dietary of infancy; but the gravy, broth, or juice extracted from meat contains nitrogenous matter in a form easily assimilated, and is of great service in infancy both in health and disease. Gravy with potato, broth, and beef tea should be part of the diet in the second year, and broth and beef tea may often with advantage be given two or three days a week in the last two or three months of the first year.

But we often have to do with emaciated, half-starved infants who are vomiting their food, and are brought down by diarrhœa, and who cannot take milk, or with those who are threatened with scurvy or rickets, or who are suffering from great deficiency of nitrogenous material in their present diet; and it is here that certain preparations made from meat have a very special value.

Beef tea, chicken broth, and mutton broth, whilst useful for diet in health, have, as is now well known, a comparatively low nutritive value, and for the conditions just mentioned are very inferior to the juice or pulp of raw meat.

Raw Meat Juice.—This is rich in nitrogenous material, is easily digested, and is antiscorbutic. It must be absolutely fresh, and be prepared twice daily at least. According to Dr. Cheadle, the best way to prepare it is as follows:—

Mince finely the best rump steak, then add 1 ounce of cold water for every 4 ounces of meat. Stir well, and let it stand for one hour. Then forcibly express the juice through muslin by twisting it. This juice contains 8·2 per cent. of nitrogenous matter, which is nearly double the amount in cow's milk, and nearly three and a-half times that in human milk. One or two teaspoonfuls of this may be given every two or three hours according to the age of the infant, combined with other food.

Raw Meat Pulp may be prepared by scraping the soft muscle element from the fibre, and administering it raw to the child. It can also be made by finely mincing the meat, and pounding it into a pulp in a mortar.

The pulp so produced is strained through a fine sieve or a piece of muslin, to remove the blood-vessels and cellular tissue. The dose will be one teaspoonful, given from four to eight times daily. A little sugar may be added to the pulp to make it more palatable to the child (*Eustace Smith*).

In all these preparations boiling is to be avoided. This would coagulate the albumen. One fear will naturally occur to the physician—does the administration of preparations of uncooked meat involve any danger of tape worms, or of other parasite? The risk cannot be denied. It is not very great, and is not to be weighed against the advantage gained from these preparations in a case of serious malnutrition. Perhaps the juice may be safer than the pulp.

Preparation of Predigested Meat.—Since it has been recognised that ordinary extracts of meat fail to contain the principal nutritive elements, various preparations have been introduced which contain peptonised meat. These can sometimes be used in this same class of cases, as a temporary diet, for they contain more or less of the fibre of the meat dissolved, and not simply the extractives. Messrs. Wyeth, Carnrick, Benger, the Kreochyle Company, and others supply such preparations. Their use as a permanent article of diet would be open to objections similar to those applying to the permanent use of peptonised food in general. We do not know how far their antiscorbutic virtues are established.

Eggs.—Hard-boiled eggs are always unsuitable. Lightly-boiled eggs, especially the yolk, are admissible in the second year, and the uncooked yolk beaten up in milk is also useful to add nitrogenous material to the diet in the latter part of the first year. The yolk of egg also contains a considerable proportion of fatty matter.

UNSUITABLE FOOD FOR INFANTS.

Those who have to deal with the class of people attending hospitals, or who visit amongst the poor, know that negative advice is needed as much as positive in regard to infant-rearing. When the infants regularly share with the adults whatever is put on the table, the consequences are naturally disastrous.

Tea and coffee must not be given to infants or young children. The abuse of tea needs to be emphasised as it is a widespread evil. (See *P. D. Report*, pp. 40, 41.) Alcoholic stimulants must be entirely avoided, except under medical orders, and, in particular, gin and spirits must not be given for flatulence and indigestion.*

In a popular work on this subject by Mr. Howard Barrett, there is given the following list of articles to be avoided in the diet of young children :—

ARTICLES TO BE AVOIDED.

New or heavy bread, hard boiled eggs, potted meats, &c., all rich and highly seasoned soups.

Meats.—Pork, veal, bacon, salt beef, duck, goose, sausages, liver, kidney, heart, tripe.

Fish.—All shell fish except oysters, and these only in exceptional circumstances. Salmon, eels, herrings, mackerel, and fresh-water fish generally.

Vegetables.—Cucumbers, radishes, celery, onions, flavouring herbs, mushrooms, broad beans, greens, and pickles.

Excess and rich character of pastry, various sweetmeats, sauces, spices, nuts, cheese, sweet and rich cakes, suet puddings, dried currants and raisins in pudding, and all alcoholic stimulants.

Of course, these are altogether inadmissible in infancy, and yet, when one visits a sick baby in the lower part of the city, any one of the above is likely enough to be the source and cause of all the mischief.

Having now considered various kinds of foods and preparations of food which afford alternative choice at successive periods of infancy, it will be useful to consider how our selection should be guided in certain cases. The signs that any particular diet is unsuitable may be either symptoms of irritation and indigestion at once, or more general failure of growth and nutrition when the diet has been tried for some time.

---

* See paper by Dr. Moore Madden on "Alcoholism in Childhood," Brit. Med. Association at Dublin, 1884, (*B. M. J.*, August 23, 1884), and discussion upon the same, especially remarks by Sir T. Barlow, for evidence as to ill effects of alcohol on childhood and infancy.

The symptoms of irritation and indigestion are vomiting (especially vomiting of sour ill-smelling food); unnatural and offensive motions and diarrhœa; flatulence and abdominal distension, causing colic, feverishness and even convulsions; constant fretfulness and crying, hot offensive breath, and loss of flesh.

A general failure of nutrition will be shown by the results of weighing, and the thinness, flabbiness, and weakness of the child, which will be unsatisfied with its food, and miserable. Signs of special constitutional disease may also develop (see Chap. ii.).

Summary of Methods for Artificial Feeding in First Nine Months.—It follows from what has been said that the ideal place in which to rear infants is a healthy country district with ready access to a farm where cows are kept under proper sanitary supervision, so that pure new milk can be brought twice daily direct from the cow in a covered sterile vessel. In a town get the milk as new as possible from a good milk depôt in bottles. Modify the milk as directed. With town milk of uncertain age and source sterilisation by boiling is to be adopted.

Artificial feeding should be carried out under the supervision of a medical man. In private families of average resources this is usually done. The poor ought to be encouraged to bring the infants to the out-patient department of a children's or general hospital for advice. It is very desirable that health visitors should have some understanding or agreement with a hospital or medical practitioner in the district as to consultation and advice in regard to the infants whom they are visiting and inspecting. I cannot but think that the physician whose duty it might be to see the infants brought to a hospital would welcome the opportunity of conferring with those who visit the patients in their homes. In fact, a system of "Consultation of Nurslings" might be thus carried out.

Almost all infants can be reared on modified milk without serious difficulty, if no mistakes be made in the earlier months, but children are very easily upset by wrong feeding, and very many babies will be found whose stomachs are rejecting the food which is being given.

See first that the bottle, milk supply, milk modification, quantity given, method of feeding are correct for the infant's age, as set forth in the preceding pages.

If when these are corrected the vomiting continue, reduce the strength and quantity, add lime water if not already given. If the child still reject the milk, try a different supply and see that sterilisation is carried out, or try condensed milk.

Next try Playfair's formula, or feed for a time on cream and whey, thus avoiding casein almost entirely. Peptonising the milk will help in many obstinate cases. If success is not obtained, and some cases are most difficult to deal with, some form of dried milk food may be resorted to as a temporary expedient, such as Allen & Hanbury's "No. 1," or Horlick's malted milk. The possibility of finding a wet nurse may well be considered. In extreme cases infants may be saved by the use of raw meat juice, or Dr. Cheadle's prescription of bread jelly, raw meat juice, and cream, as given on p. 100. The progress of the child's weight must be carefully watched.

Having found a food which the child does not vomit, it is necessary to watch very carefully, lest the exclusion of some element from the diet should cause ill effects. If we are partially excluding casein, a little meat juice will supplement the nitrogenous constituent, and prevent scurvy. Too much cream will cause regurgitation of sour masses, but too little cream is the more common error.

Again, when the child is taking diluted milk and is not thriving, but the vomiting recurs when the food is made stronger, some kind of malted food may give temporary help.

We have spoken plainly about the abuse of farinaceous food, but we cannot hold that it has no use at all in early infancy. In such a case as we have supposed, say at the age of three months and onwards, once or twice a day from 30 to 60 grains of Mellin's food may be given, and later on some less highly dextrinised food may be used with advantage. Always watch for signs of irritation and indigestion when any change is made in the diet. With similar care we must always seek to accustom the infant gradually to dispense with predigested foods, and to take food in its natural state, and the return to a normal diet at the earliest time practicable should always be aimed at. In these difficult cases medical supervision is most essential, for assistance can be given in many cases by medicinal treatment of the disordered stomach and bowels.

Diet after Weaning.—The diet at the time of weaning should be that appropriate to an age slightly earlier than that which the infant has actually attained. A child just weaned cannot at first take cow's milk so well as one who has been accustomed to it by artificial feeding from the bottle. The strength of the food must be increased gradually, due watch being kept on the weight. The motions also must be carefully watched for evidence of undigested food or diarrhœa. At this time care must be taken not to change the diet too suddenly or increase it too rapidly, for overfeeding is a common mistake when weaning has just been accomplished.

DIETARY AT ABOUT NINE OR TEN MONTHS.

Give five meals in the day.

First Meal, about 7 or 7.30. This should consist of about 8 ozs. of boiled milk, with the addition of some farinaceous food prepared in one or other of the ways already described. For example, a choice may be made of bread, baked flour, flour ball, entire wheat flour, revalenta, barley jelly, barley biscuit, &c., and if these do not agree, some kind of malted food may be temporarily substituted.

The Second Meal, given about three hours later, may be a lighter one, and may consist of about 6 ozs. of milk, which may be previously boiled, &c., should not be given quite undiluted, and which may need some alkali or barley water to assist digestion.

The Third Meal is given at the time of a mid-day dinner, say 2 p.m. This meal should contain some nitrogenous food; for example, about 6 ozs. of beef tea may be given with a rusk, or the yolk of an egg beaten up in milk. Do not forget a pinch of salt.

The Fourth Meal, about 6 p.m., should be a repetition of the first.

The Fifth Meal, the last thing at night—*i.e.*, 10.30 or 11—is a repetition of the second.

AT ABOUT TWELVE MONTHS TO EIGHTEEN MONTHS.

The First Meal, much as before. Bread and milk varied with farinaceous foods made with milk, occasionally the yolk of an egg beaten up. Fine oatmeal also useful.

Second Meal.—Milk as before. A little thin bread and butter or biscuit should be added.

Third Meal.—Amount of nitrogenous food gradually increased. Gravy and potatoes, gravy and bread crumbs, egg yolk and milk, beef tea and broth. May be followed by a "second course" of some light farinaceous pudding—sago, rice, tapioca, &c.

Fourth Meal.—First repeated.

Fifth Meal.—A simple drink of milk. Do not increase this, as it will be discontinued shortly.

FROM EIGHTEEN MONTHS TO TWO YEARS.

Four meals daily are usually sufficient. The fifth meal may be discontinued, and the child will very likely sleep from 6 p.m. to 6 a.m. The solids of the diet can be increased, a little cooked meat, minced and pounded, can be taken occasionally, or boiled fowl or fish. The amount of potato, bread and butter, and farinaceous puddings can be increased. A little fruit, stewed or preserved, may be taken occasionally.

THIRD YEAR.

In the third year the fatty matter is supplemented by giving bread dipped in bacon fat at breakfast, and by spreading plenty of butter on the bread. Good milk is still a very great necessity. Underdone meat well minced is given in small amount, and the child is taught to masticate. Honey, treacle, marmalade, jam in moderation are useful, and help a child with small appetite to take other food. Porridge, biscuits, and cocoa may be given sometimes, also apples, baked and stewed, and bananas.

DIET FOR RICKETS.

In case of a child who shows a tendency to develop rickets, it is necessary first to discover anything in the diet which may be upsetting the child's digestive organs, and to seek by appropriate treatment, medicinal and dietetic, to cure any gastro-intestinal catarrh that may be present.

Next, one must find out whether any essential element is deficient in the diet. Generally speaking, the fatty element must be increased, cream especially must be added, and good fresh milk must be secured and prepared as may be necessary by one or other of the methods already described. The nitrogenous element must also be supplemented, and one of the preparations of meat juice may be resorted to. The well-known remedies, cod-liver oil, iron, and phosphate of lime, may be employed also, but are no substitute for dietetic measures. For the general treatment of the disease we must refer the student to ordinary text-books. We may, however, remind him always to investigate the history and symptoms of the child with regard to a possible syphilitic taint, in which case a course of grey powder will often help the cure very considerably.

DIET IN SCURVY.

This can be gathered from what we have already said. Milk fresh from the cow, raw meat juice, potato gruel, orange juice, grape juice, or lime juice are the most available antiscorbutics. Some iron and cod-liver oil may assist the cure.*

DIET IN CONSTIPATION.

It is always best to relieve constipation, if possible, without resorting to drugs. In breast-fed infants it is sometimes sufficient to alter the diet of the mother, and to give her laxative food, such as oatmeal porridge and treacle, stewed fruit, baked apples, prunes and figs, and bananas.

In the case of a hand-fed infant an increased dilution of the milk, and the use of barley water or oatmeal gruel as a diluent, will sometimes answer. Brown sugar and small quantities of honey may be used instead of white sugar for the food, and a teaspoonful of strong simple syrup may be given in the morning. More cream, too, should be given, and oatmeal may be added to the bottle. Some of the malted foods also are laxative.† When the second year is reached oatmeal can be given more freely. Treacle may be added to puddings, and baked apple pulp may be employed. To seek to procure an action of the bowels at *a fixed time* (see p. 117) is a very great preventive of costiveness, and systematic massage of the abdominal wall in young infants will often help.

DIET IN DIARRHŒA.

Infantile diarrhœa will be found to be discussed at length in all books on medicine in general, and children's diseases in particular. Here we will only remind the student to consider the following questions:—If the child be suckling, examine the diet and health of the mother; also see whether the child has thrush. If the child be bottle-fed, examine the bottle and the food. If it does not seem to be due to decomposing food, or excess of casein, or to wrongly constituted dietary, consider the source of the milk, the food of the cow, the water supply and sanitary condition of the house. If it be a question of irritating diet, remove the offending element and simplify the diet, but do not starve the child. After removing the cause, well-judged *drug* treatment is a very great help, but for this medical advice should be sought by the nurse.

---

* In the pharmacopœia of the Great Ormond Street Hospital for Sick Children is a formula prescribing equal parts of iron wine, cod-liver oil, and glycerine. Infants usually take this well, and often seem to relish it greatly.

† "In the first few weeks of bottle-feeding constipation is very common, and may be effectually remedied by placing as much phosphate of soda as will lie on a threepenny piece in the bottle, two or three times in the twenty-four hours" (Playfair). See also Cheadle's "Lectures on Constipation in Infancy," *Lancet*, 1886.

CONCLUDING NOTES ON DIET.

1. There is no *one* formula for infant-feeding. Infants have their likes and dislikes and peculiarities as well as adults. The best method of artificial feeding has an element of uncertainty about it, and what will succeed with one will fail with another. Variety is necessary; but new articles of diet must be introduced one at a time and the effect noted carefully.
2. Food should be given at a temperature of about blood-heat, say 95° to 100° Fahrenheit.
3. It must be freshly prepared, and what is left over must not be kept for a later meal. This is especially true of all milk-containing food.
4. In artificial feeding, remember that salt is necessary for diet in infancy.
5. Overfeeding is a very common error, and a reduction in the amount of food, or a return to a simpler diet, will often be followed by marked improvement when restlessness, flatulence, and indigestion trouble the growing infant.
6. Do not hurry the child over its meal, rather intersperse the meal-time with pauses. The more solid the food, the more slowly it should be swallowed.
7. In using a bottle, be carcful to avoid any sucking after the bottle is empty, for this fills the stomach with air. The bottle may be discontinued at the end of the first year, and the spoon used for feeding.
8. Do not feed the child before breakfast or between meals.
9. Fine subdivision of the food is essential for good digestion. Infants cannot masticate. Too large pieces of meat or vegetable may cause violent indigestion.
10. Food should not be kept in the nursery any more than in the sick room. For infant's food generally the use of the

refrigerator has great advantages. The risk of keeping milk warm in the bedroom through the night is obvious. Food should be protected from flies.

11. The idea that it is desirable to obtain milk from one cow only is now abandoned. Nevertheless, it has probably been followed by much benefit in the past, by leading to milk being received in a special clean vessel and conveyed direct to the consumer, thus avoiding the contamination caused by careless storage and tardy delivery.

12. It is a very common thing to see infants provided with a separate teat, fastened to a ring tied round the neck. The child sucks this almost all day long when awake, and goes to sleep with it in the mouth. These are called "**comforters**," and are sold by all druggists. Much dirt is introduced by this teat. It is also thought that the incessant use of these appliances produces a high, narrow palate, with nasal obstruction and post-nasal adenoids, so that the children become "mouth-breathers." This is a point for the health visitor to notice (see *P. D. Report*, evidence by Dr. Young, p. 91). The use of such appliances was made illegal in France by the *Roussel Law*, passed in 1874.

13. It may be well to remark that some children may thrive *in spite of* their diet being "wrong" and their surroundings unhealthy. Plump, rosy infants are now and then found in a city slum, while pale and puny ones may be seen in a good country home. This does not disprove the soundness of the principles here laid down for the rearing of the greatest number of healthy infants.

CHAPTER V.

HYGIENE OF INFANCY.

ENGLISH CHILDREN IN TROPICAL CLIMATES.

Next to pure milk, the most essential condition for rearing healthy infants is **fresh air**, and, as far as possible, the child should spend its time in the **open air**. Fresh air within the house is a matter of good ventilation, open windows, and avoidance of sources of foul air, of which we will speak hereafter; but we wish to draw special attention to the value of **outdoor life** in infancy. For many years past the medical profession and the public have been realising to an increasing degree the usefulness of open air in the treatment of tuberculous and other diseases. Even at our large city hospitals children and adults can be seen sleeping out on balconies all day, and often all night. But if this is good for those with consumptive lungs and chronic disease of other parts, it is good for healthy men and women and children.

People of all ranks are beginning to realise the benefit and refreshment of sleeping out in suitable tents and shelters, and we are sure that the practice will widely spread, as the requisite means of doing so with privacy and security are provided.

Children who can run about the country in the lanes and fields, the gipsy children on the heaths and commons, often bareheaded and barefooted, compare very favourably with the children of well-to-do parents, who keep them in warm nurseries, with draughts carefully excluded, forbidding the daily walk on very small pretence of damp and fog. The gipsy children have not better instructed parents, and are often poorly fed, but they get the open air, and owe their health to it. We have a profound pity for the little children of five and six years of age who are congregated in infant schools to begin their education (!) when they ought to be playing outside all day. We have no hesitation in saying that if children could stay in the open air all day till they were seven years old, and then, and only then, begin to learn their letters, there would be a great increase in the physical fitness of the rising generation, and no loss of intellectual activity or scholastic attainment. At present such an idea is utopian as regards the classes where infant mortality is greatest, to say nothing of involving a breach of the law. We are very glad to notice that the *P. D. Report* recommends (p. 90) that school attendance in rural districts should not be compulsory till the age of six or seven, and should be discouraged, if not absolutely prohibited, under five. In Switzerland, where the education is perhaps the best in Europe, children do not begin school under seven.

To return to the infants, the general rule is to **take the child out every fine day,** summer and winter, except when cold east winds are blowing. At first the child should be carried in the nurse's arms, as this is warmer than the perambulator. The nurse will do well to carry the infant in a "baby-carrier," which is a netted sling passing over the left shoulder, in which the child lies safely. This is less fatiguing, and the right arm is set at liberty for use in opening doors and protecting the child. Let the walk be short at first. Two brief outings are better than one long one.

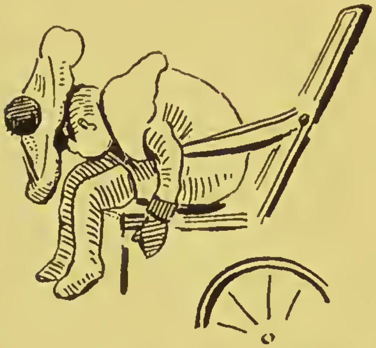

Fig. 18.—How *not* to wheel a baby. (From a sketch by the late R. F. Reynolds, Esq.)*

The perambulator used should be one in which the child can lie at full length and go to sleep. The old-fashioned perambulator, in which a child can sit but not lie, is very unsuitable for young children, and still more so is the child's "mail cart." In this a weak or sleeping child falls forward in a very unhealthy attitude (see Fig. 18).

The baby carriage makes an admirable shelter for sleeping out. It must be protected from hot sunshine and from cold winds. A hot water bottle may be placed in it in cold weather.

In Leeds, where the climate is fairly cold and bracing, infants a few weeks old sleep outside for several hours daily in the warmer months with great benefit, if clothed enough for the season.

Ventilation.—Children cannot thrive in an atmosphere charged with carbonic acid gas, and with air that has been breathed over and over again. An extremely simple and useful test of the freshness of the atmosphere is to enter the room directly after leaving the outdoor air. Any close, unpleasant odour can then be readily detected. The aim of the nurse is to have the nursery or sick-room so well ventilated that no such odour shall be perceptible. It must be confessed that in England it is not easy to obtain by any one simple method adequate ventilation all the year round, because the external temperature varies so greatly and so suddenly, and the presence or absence of wind makes so great a difference. When there is a fire burning it will usually effectually ventilate the room, for if there is a good up-draught in the chimney the air will come in at every window and door, and even through the walls and the cracks in the floor. If the infant be shielded from direct draught, the opening of the upper part of the

---

* Published by the kind permission of Messrs. Reynolds & Branson, Ltd.

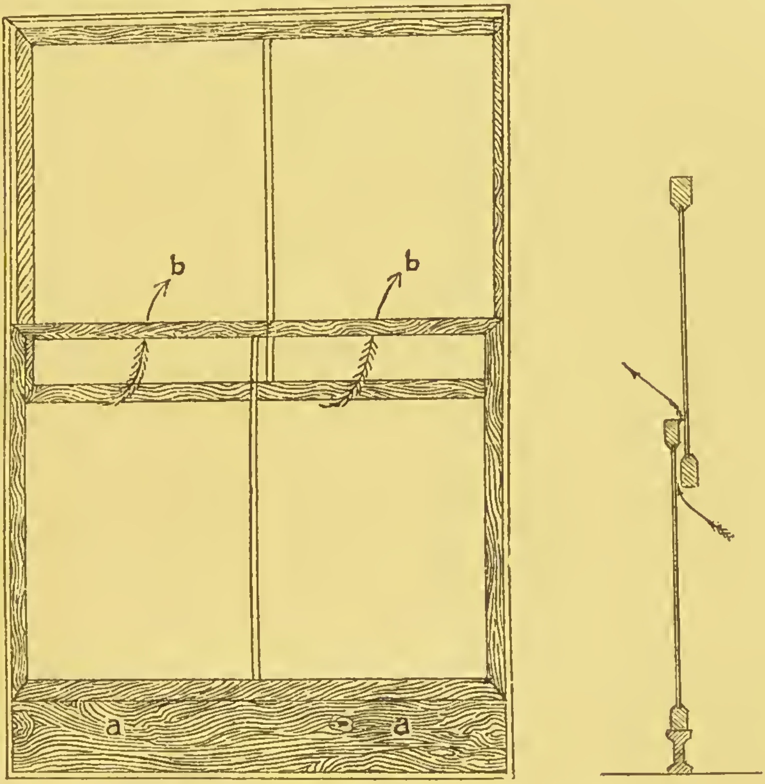

Fig. 19.—A simple form of window ventilator.

window will be unattended with risk. In the warm weather the window is always open. Ventilation can also be obtained from the window by the following simple plan :—

A piece of wood 2 or 3 inches deep, and as long as the breadth of the window, is made to fit in below the lower sash, which is then shut down upon it. (See *a*, *a*, Fig. 19.)

By this means a space is left between the upper and lower sashes, where the air can enter with an upward current (*b*, *b*). If the blind be drawn down a little way it will help the gentle diffusion of the air. There is thus provided an adequate inlet without draught.

For details of more complicated ventilators, which require fixing by structural alteration, the student is referred to text-books of Hygiene. We may, however, refer to Mr. Pridgin Teale's excellent method of ventilation with air filtration, as described in his work on *Dangers to Health.*

Every day the sleeping-room must be thoroughly flushed out with fresh air, by opening the windows top and bottom. The same thing must be done in the day-room, and then the child must not be brought into it until the thermometer stands at the proper temperature.

Warmth.—On the need of heat we have already dwelt, but there are methods of obtaining this which are bad. Very hot rooms are to be avoided, and still more rooms which are both hot and close. The burning of gas in open burners in order to heat a room quickly is to be especially condemned; even a gas stove with a good up-draught into the chimney cannot be recommended for nurseries, but one without a chimney is an utter abomination.

A room which becomes very hot at one part of the day is almost certain to be much colder at some other part. Such variation of the temperature, especially when combined with vitiated air, is a great cause of colds and bronchitis. Mothers sometimes express great perplexity as to how an infant can have taken cold. If the nursery be overheated, and the air impure, the cause is not far to seek. Hence, what is needed is a uniform temperature and a pure atmosphere. There must be a thermometer in the nursery, and this should not stand above 65°, or below 60°. The thermometer must be hung near the cradle, for currents of air may make one part of a room cooler than another. We must give special caution against the practice of taking an infant from an overheated day-room to a cold bed-room. In the winter evenings the difference between the sitting-room and the bed-rooms in many houses is as much as

SCHOOL OF MEDICINE
UNIVERSITY OF LEEDS.

20° or 30°. This is why some adults cough for an hour after retiring to bed, and many cases of infantile bronchitis are accounted for in the same way.

The nursery then must be a healthy room in a healthy house. Children will not thrive in an atmosphere contaminated with sewer gas, but are likely to be pale and sallow, to suffer from vomiting and diarrhœa and sore throat. The symptoms, however, may be vague and ill-defined, amounting to little more than general sickliness and malnutrition, and may be easily ascribed to anything but the right cause. No householder should take it for granted that the drains are sound because they have once been certified to be so, but should have them periodically inspected; for traps may run dry or become choked, pipes may be damaged or obstructed, and joints may give way. This inspection should, however, be done before the birth of the child, for no confinement should be allowed to take place in an insanitary house.* The nursery should have ample cubic space, not less than 500 cubic feet per infant, and it may with advantage be 800, or as much more as possible. The aspect should, by preference, be south, so as to get the maximum of sunlight. Warmth and ventilation must be attended to. If there be a bath or lavatory basin or sink near the nursery, it is of special importance that they should be duly disconnected from the drains. Cleanliness must be maintained, and all excreta and stale food, &c., must be promptly removed from the room. Curtains and hangings are to be avoided as much as possible. Carpets become fouled and stained by the accidents inseparable from infancy. Stained waxed floors, with a loose rug which can be frequently shaken, are satisfactory. The "cork-carpets" now sold are warm and washable, and very suitable for nurseries. Whenever possible there should be a day-room and a night-room, for this greatly facilitates cleanliness and ventilation.

Light in the nursery is secured by a suitable aspect and by good-sized windows. Windows that descend to near the ground are to be preferred. If a low table be placed for the child's toys in front of the window, the child can play in the sunlight. The ideal arrangement is to have a bay window with a window-shelf running round it. Children always make for the light, and will revel in such a spot as this. Due protection against draughts is pre-supposed. For children's nurseries, as for libraries and picture galleries, avoid gas, and substitute candles or lamps, or electric light.

---

* We can recommend as a good practical guide for a householder a book entitled *Is my House Healthy?—How to find out*, by Dr. Spottiswoode Cameron, Medical Officer of Health for Leeds. Also, *Practical Sanitation*, by Dr. Geo. Reid, D.P.H., Medical Officer to the Staffs. County Council, may be recommended to all who wish to go further into the subject.

The walls should be covered with papers free from arsenic, and these may be varnished to allow of washing, or the walls may be painted, and treated like those of hospital wards.

In furnishing a nursery, everything that can harbour dust and dirt must as far as possible be avoided.

Nursery windows must be well **protected** by bars or well-fixed wire netting. Children have a great fondness for climbing, and constantly surprise us by the unforeseen enterprises which they attempt and accomplish. The **fireplace** must be protected by a high fire-guard firmly secured. A painfully large number of burns occur amongst children who are left unwatched. All medicines, &c., must be locked in a cupboard, for children may climb to high shelves and taste what they find there. Matches, scissors, pins, needles, and knives must never be left within their reach. A **gate** at the top of the staircase should also be provided.

Out of doors, children seem to have an irresistible tendency to run in front of rapidly-moving vehicles, especially cycles, trams, and motor cars. Nothing but constant vigilance can ensure safety.

Cleanliness, Ablution.—An obvious difficulty attends the maintenance of cleanliness in infancy. The genital organs and the adjacent parts of the thighs and buttocks are continually soiled with urine and fæces, which are apt to cause redness and soreness of the skin, especially when the excretions are irritating in their nature and where the infant is weakly. Under such circumstances the irritation may reach a very high degree, the parts becoming red, hot, swollen and painful. Every sick-nurse knows that when in an adult patient incontinence of urine and fæces set in, similar difficulties have to be contended with. The great preventive is cleanliness. The diapers must be changed as soon as they are soiled, and the parts carefully washed and thoroughly dried. A wet napkin should not be dried and then used again unwashed for this helps to cause soreness. The child must also have a bath each day at a regular hour, and a strong healthy child may be bathed twice daily. Do not immerse the new-born child till the navel is healed. Avoid bathing immediately after a meal. The temperature of the bath must not be merely judged and guessed with the hand, for the sensation of heat and cold to the hand is fallacious, but a bath thermometer must be used. The water must not be too hot, for an infant's skin is very tender. The temperature should be about 90° F. (or 32·2° C.), and should not exceed 95° F. Prolonged immersion is not desirable at first, and in the case of delicate infants the bath may be as brief as possible, for weak infants do not stand much bathing and might be found cold in the extremities and blue about the lips in consequence, and in such a case it should be omitted altogether, and sponging substituted. Soap with much soda in it is apt to irritate the skin. Glycerine soap is free from this objection, and Castile soap is also good. It should be remembered that sponges harbour dirt, and that it is difficult to clean them thoroughly. If the child have any excoriated surface, a dirty sponge may do serious harm. In drying the child the greatest care must be taken to cleanse the folds of the skin, the genital organs, the armpits, the back of the ear, and the creases in the neck, for carelessness in this respect is a great cause of chafing and soreness. A soft towel must be used. The powdering of the skin with starch powder is a common and useful practice, but when there is redness or chafing, something of a greasy nature acts very well, and the boric (or boracic) ointment of the British Pharmacopœia is exceedingly useful for this purpose. Fuller's earth is also very useful.

When a child is ill it is often better to suspend the bath, and substitute sponging. If the child have a rash on the skin, especially one that "weeps" or discharges, washing in soap and water should be avoided.

From the first the child should be "held out" regularly after the morning bath, for this will promote a daily action of the bowels at a fixed hour, and will prevent constipation.

In practice amongst the poor we find the hair greatly neglected. It is too often matted and infested with lice, and the "nits" (or eggs) of the louse. The parasite thrives best in weakly children. The lice are killed with carbolic oil (1 in 40). The nits are removed with vinegar and water, or paraffin. Stavesacre ointment, and white precipitate powder or ointment, are also efficient parasiticides. Due cleanliness, however, will prevent the onset of this condition.

If a nurse have any sores on her own hands, as, for instance, a whitlow or an abscess around the nail, she is a source of infection, and any scratch or sore on the child might become infected by her. She should not touch the child until she is well. A nurse with a running ear or a gland abscess is not suitable for her duties.

Clothing.—The use of clothing is to promote warmth by preventing loss of heat from the skin. It is far better to maintain heat by this plan than by high external temperature. *Keep the rooms from becoming too hot, keep the child from becoming too cold.*

The first clothing of an infant is regulated by national and local traditional customs to a remarkable extent, and curious and interesting results would be obtained from an extensive study of the subject. In some parts of China, for instance, infants at first lie naked under the bedclothes, and when they are older they are dressed in loose baggy trousers partly filled with sand. This plan provides for the absorption of the excreta, and is considered to have the further advantage that the weight of the sand keeps the child from undue wandering.* In India the children do not wear a rag till they are three or four years old.

In France the use of the *maillot* (swaddling clothes) is common. In England infants are dressed at first in robes of a length and amplitude which are ludicrously disproportioned to the small size of the new-born child. In about three or four months they are suddenly "shortened"—*i.e.*, put into short clothes. After this the clothing commonly errs on the side of insufficiency. It is a common thing to see children with the neck, arms, and legs bare, and the thighs and lower part or the abdomen covered only by short skirts, under which the wind has free access, and which form no protection at all as the child crawls and sits on the ground, or in the gutter.

In cold nothern climates this exposure, and consequent reduction of temperature, is a serious danger. Yet one often sees the children sitting on the pavement or damp grass, with arms and legs blue with cold. No doubt the high mortality from pulmonary and abdominal disease is partly due to insufficient clothing.

The clothing of infants and children must be free from constriction and discomfort. The first clothes of the infant are best made to open the whole distance from top to bottom, and to fasten by folding over and tying the tapes, pins being avoided. This makes it easy to put them on, and the arms will never be strained through being forcibly dragged at an awkward angle into a sleeve. The clothing must not be too heavy.

After the navel is healed, it is not desirable to employ a tight abdominal bandage. There is no sense in constricting the child's body. This is a mistake often made. On the other hand, a band of flannel may be used to keep the chest and abdomen warm in cold weather, but it must be loose. In fact, moderately loose clothing is warmer than that which is worn tight.

---

* A. H. Smith, *Chinese Characteristics*, Shanghai, 1890. Of one who shows babyish traits, it is said, "He has not yet been taken out of his earth trousers."

As to material, a woollen fabric of loose texture is the best non-conductor of heat, and it is also soft as an infant's clothes should be. Flannel, merino, and Scotch wincey are excellent for the purpose, and knitted woollen garments are warmer still, for they contain more air. These may be worn next the skin. It is only occasionally that the skin is so tender that a cotton or linen shirt is necessary. "Flannelette" is made of cotton and it may have a little wool in its composition, but usually it

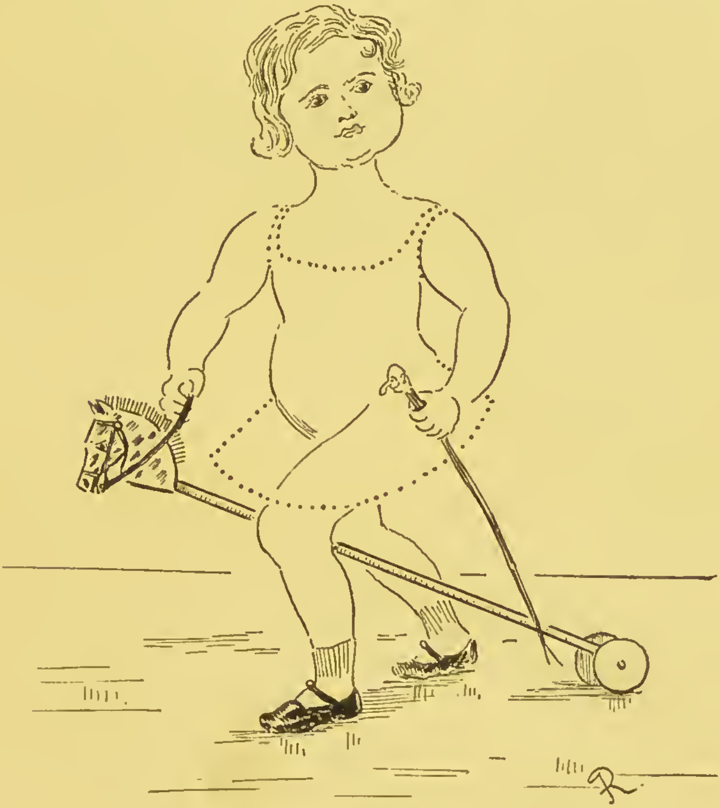

Fig. 20.—"Shortened!"*

---

* For this sketch the author was indebted to the pencil of his friend, the late Mr. R. F. Reynolds of Leeds. The subject is treated diagrammatically, but the satire is almost without exaggeration.

has none. It is also highly inflammable, and many accidents have occurred from this cause.

After "shortening," the clothing should be ample, and should cover the child from neck to ankle. Long stockings reaching to the diaper form the best covering for the legs and thighs, followed by flannel drawers when the diapers are discarded. In addition to the constant change of diapers, a daily renewal of the underclothing is necessary. Loose flannel or knitted drawers may with great advantage be worn outside the diapers.

Coverings for the Feet.—In a baby's foot we see the natural shape of the human foot. In the adult Englishman or English woman we *never* do. The feet are always more or less distorted by the shoes and boots which we wear. Hence come corns, bunions, ingrowing toe-nails, and inflamed toe-joints in those who are gouty. Never let an infant's feet be pinched by its shoes. Let these be broad at the toes, and soft and yielding in texture. They should be made by taking a tracing of the foot, and constructing according to that pattern.

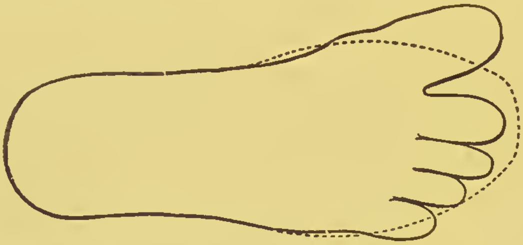

Fig. 21.—Tracing from the foot of a lad of six years old who had never been shod.

The author here gives a tracing of the foot of a Scotch lad of about six years of age, taken some years ago on the side of Arthur's Seat in a Scotch holiday. The lad said he had never worn a shoe. Note the manner in which the toes spread, and how the great toe points inwards. The dotted line shows a very moderate estimate of the shape of shoe this lad would have been wearing had he been born in England.

Exercise.—Within doors, before the child can crawl, it seems to afford him pleasure to lie on the ground on a rug and kick his legs about; and this may be encouraged, and, generally speaking, the child may take the exercise in crawling, standing, and walking that he evidently desires. But it is a mistake to make a child sit, stand, or walk prematurely; when the muscles and bones are strong enough their use will come to them naturally; but if they be weak, and especially if the constitution be rickety, deformity will result from too early use of the legs and spine.

Sleep.—The child must sleep in a cot separately, and not with the mother in her bed. This is to avoid overlying. The cot must not stand in a draught. The bedding should be well aired daily, by open windows and sunshine if possible, and on wet days by the heat of the fire. Above all things avoid a damp bed. This means care, because the child may wet the bed.

A healthy child sleeps most of its time at first, and can hardly sleep too much. Throughout infancy it should sleep from about 6.30 p.m. to 6 or 7 a.m., with times of feeding as stated on pp. 74 and 91. During the day it should have a morning sleep and an afternoon sleep, each of two hours or more. It is well to keep the child awake for an hour or two before the coming bedtime, so that it may become a little tired and drowsy, and so rest the night through. Protect the sleeping child from flies.

Children in towns, and especially in the slums, suffer from too little sleep. They are kept up very late, are even found with their mothers in the public-house at closing time, and, if put to bed, often cannot sleep in the overcrowded, noisy room. They suffer in consequence from irritability and nervous exhaustion (see *P.D. Report*, p. 56).

The health visitor may be able to induce some parents to remedy this.

Accustom an infant from the first to be put to bed, and *left* to go to sleep without rocking, or further measure of suasion. It may cry for a night or two, *but it will soon learn*, and this will save the mother endless trouble. It is also the first step in the child's moral education.

The advice is commonly given that children should *not be rocked* to sleep. For the reason just stated the advice seems sound.

Hygiene of Dentition.—It seems to be popularly supposed that the fact that a child has reached the period of teething is sufficient explanation of almost any disease from which it may suffer ; convulsions, bronchitis, vomiting, indigestion, diarrhœa, constipation, skin eruptions, and other conditions are considered to be the result of the teething process, and the appropriate treatment is supposed to be purgative "teething powders," soothing syrups, and the gum lancet. Much harm results from such loose notions and practice. There can be no doubt that the cutting of a tooth may cause local irritation in the mouth, and general symptoms in the body, especially feverishness, restlessness, and general *malaise*, or convulsions also may sometimes occur during teething, especially in rickety children ; but when a teething child suffers from bronchitis, vomiting, or diarrhœa, it will usually be found that some other cause has been acting as well; that the child has been unduly exposed to cold, or that some dietetic experiment has been made on its stomach, or the bottle has been sour, or the laws of infant health have been violated somehow, or there is constitutional disease.

The moral of this is, that when a child is ill in the teething period, the remedy is not to be found in any one particular nostrum, but the whole of the conditions present must be taken into consideration.

"Teething powders" are usually purgative, and very often contain calomel. It is not a good thing to give a child purgatives except it be distinctly costive, and the constipation cannot be relieved by diet. Habitual dosing with purgatives is to be avoided.

"Soothing syrups," when effective, usually contain some form of opium (or morphia). There are some remedies which children take well, but opium is *not* one of them. On the contrary, they are specially susceptible to its action, and it should never be given except under medical direction. Many an infant has been "soothed" once for all and finally by soothing syrups.

As to the **use of the gum-lancet** doctors differ. When a child is in convulsions, or threatened with them, the lancet may be used on the chance of relief being obtained. When over the coming tooth the gum is red, hot, swollen, and tender, many hold that there are clear indications for the use of the lancet, but to use it as a matter of routine on a cool unreddened gum, just because the child is out of sorts, is a great mistake. The great principle for the treatment of teething is to maintain the health of the child by the healthiness of its diet and surroundings.

There is a notion, common amongst mothers, that it is undesirable to cure diarrhœa and certain other affections noticed during teething. This is a complete error, and one which sometimes leads to neglect of serious symptoms.

Care of the Milk Teeth.—A point very commonly neglected in the hygiene of infancy is the care of the first set of teeth. If these decay, and especially if they decay so far and cause such pain as to necessitate extraction, the second set are apt to be irregular and crowded.

The teeth should be cleaned twice daily as soon as there are teeth to clean. It is a still better plan to clean them after food, especially starchy or sugary foods. Simple rubbing is not enough. It is best to use a brush. A little prepared chalk may be used also. If a greenish stain be seen where the tooth joins the gum, it is important to get this off; chalk is hardly sufficient for this; pumice powder is better, and it may be applied with a pointed piece of soft wood.

It is important not to give children sweets after their teeth are cleaned; nurses have a habit of giving a child a sweet to suck as it goes to sleep at night. This is bad for the teeth.

It is best not to transfer saliva from one mouth to another. Nurses often do this when they put the spoon, or teat, or even some of the food from their own mouth to the child's. If the teeth do become carious, the child should be taken to the dentist.

Vaccination.—This is usually performed before the child is three months old. There is nothing gained by postponing vaccination, for the predisposition to small-pox is marked in infancy, and the mortality at this period is high. If small-pox be prevalent in the neighbourhood, hardly any age is too early for vaccinating. In cases of ill-health the practitioner may postpone the operation for two months at a time, and may repeat this postponement indefinitely. The presence of any skin eruption, especially eczema, is a reason for postponement. If one vaccinates an eczematous child, the disease may affect the pocks, and may spread from these as from a centre, and the vaccination will be blamed.

Of the safety and efficiency of good vaccination it is not necessary to speak here, but there is no surgical procedure, however simple, in which the precautions of surgical cleanliness can be dispensed with. In addition to pure lymph, a clean arm, and a sterilised lancet, the scratches and pocks themselves must be kept clean. When one thinks of the dirtiness of some of the infants brought for vaccination, of the filth of their clothes and surroundings, the uncleanliness of those that nurse them, the various applications made to the arms by ignorant people, and the possible existence of discharging wounds and sources of septic infection on the persons of those with whom the infants come in contact, one cannot fail to be impressed with the small amount of evil that ever results from vaccination.

Hygiene in the Years next following Infancy.—We will briefly refer to some points of importance. The less the regular routine of a child's life is interfered with the better, especially as regards meals, out-door exercise, and sleep. Let the child be much in the open, but avoid too long walks, and let the nurse take the perambulator in case the child should be too tired to walk home. Avoid long journeys, irregular hours, exciting entertainments, dietic follies, and infant "parties." These things upset the young to an extent that seems disproportionate to the cause. Children derive most benefit from playing with a few companions of their own age in their own way. This is better than the dull routine walk along a road, and they come in with better appetites.

Let the child have a mid-day rest as long as this practice can be continued. Never keep them up late, and let them have twelve to fourteen consecutive hours in bed.

Town children should be taken into the country twice a year if possible, especially if they live in large manufacturing centres. There is no need to take them to distant health resorts; a quiet village in the nearest suitable country district is best. A quiet seaside place is good, but not an ordinary seaside resort with crowds of visitors and exciting entertainments, which are unsuitable for little children.

Much railway travelling also upsets them.

Avoid startling and frightening children. Above all, beware of the foolish nurse who threatens the child with what the "bogie man" or the "black man" will do "if they are naughty." A lasting dread is thus often created in children's minds, and their imagination keeps them awake at night with vague fears. Only very foolish parents allow their children to have miscellaneous sweets and cakes given by friends and visitors at all hours. No drugs should be administered except by medical orders. The mother should possess a clinical thermometer. If the child does not seem well, she should take the temperature (see Chap. I.), and, if there be fever, should keep the child in bed on low diet, and it will usually be better next day. If not, the doctor should be sent for.

If they become costive, the treatment should be by laxative diet rather than by drugs. Porridge and treacle, oranges and bananas, stewed apples and pears, suet puddings, marmalade and honey are useful for this purpose. Strict regularity in going to stool is very important in this respect. Avoid tea and coffee and every form of alcohol.

In the summer months, the danger of sunstroke must be borne in mind.

REARING OF ENGLISH CHILDREN IN TROPICAL CLIMATES.

For the following notes the author is indebted to various medical friends and to Dr. E. A. Birch's work on *The Management and Medical Treatment of Children in India.**

---

* Calcutta and London: W. Thacker & Co.

In spite of the fact that scarlet fever, measles, whooping-cough and other disease of childhood are far less prevalent and less serious than in England, **infantile mortality** is very high in India, both amongst English children who have been brought out from home and amongst those born in India. This is attributed to mistakes in management; any error in dieting or hygiene brings a far more serious punishment here than at home. But if the best possible care is given in India, children can thrive there up to six or eight years of age quite as well as in England, if not actually better. This was the opinion of the late Sir Joseph Fayrer.

But sour milk, foul water, and the like are very formidable foes, and the children of the soldiers in the plains die in especially large numbers.

The following points seem to be of practical importance:—

Breast Feeding.—Anglo-Indian mothers can rarely do much suckling.

The supply of milk may be plentiful at first, but it gradually decreases after the first fortnight, and to be able to continue after the first two or three months is the exception. Succeeding pregnancies are followed by still less success. This seems to be the case also in China, at least in the hotter parts.

Wet nurses can be found amongst the natives. The Indian name for them is *dhai*. The danger of syphilitic infection is great, and no nurse should be engaged without a careful medical inspection. This is also very important in China, where the symptoms are little understood and the statements of the women notoriously untrustworthy; popular sentiment is against their use.

Dress.—Children in India are often over dressed by unwise parents who swaddle them up in hot flannel clothes. By day Anglo-Indian children should wear little white knickers, with an overall with short sleeves and low neck, and sandals on the feet. By night they must wear white viyella pyjamas made with upper and lower parts all in one piece, short sleeves and low neck, so that if they toss about there is no danger of getting the body uncovered.

The difference between the day and night temperatures, especially in the hot seasons is very great. Let the child sleep in a fairly big cot, with mosquito net, and with doors and windows open under a punkah or electric fan. Professor Ross tells me that special stress should be laid on the systematic use of the punkah by night and day. Mothers cannot be too careful not to let the children be put under inexperienced native girls, such as the ayah's daughter. She may easily expose an infant to the full rays of the sun pouring through a window, and when the child becomes feverish will declare that she never took it into the sun.

A flannel binder round the abdomen, or *cholera belt*, is useful to prevent gastro-intestinal affections.

Very young babies do very well in the heat of the plains, often they are not well when taken to the hills—the richer food, the colder air and the moisture tend to upset them. Older children improve very much when taken to the hills, but they should be warmly clad round the abdomen to prevent "hill diarrhœa."

Artificial Feeding.—For this cow's milk is employed. The cow is kept in the "compound" or driven to the door. The process of milking must be vigilantly supervised or the milkman may put some water in the vessel beforehand or squeeze a wet cloth into it when your back is turned. You will prefer to provide your own clean vessel. The milk should be fresh morning and night. It should be cooled rapidly, kept covered up in a refrigerator or the coldest place available. It should be boiled before use. Sterilisation with storage in sealed bottles is widely practised. For long journeys condensed milk and dried milk foods are useful. The milk is poor in fat and sometimes a little cod-liver oil is given to compensate. Goat's milk is often obtainable. Children suffer much from *thirst* in hot climates, and great care must be exercised to prevent them from drinking unboiled water. All the precautions needed at home are doubly necessary here, for the sources of water contamination in India are notoriously great. Cholera, typhoid, and all forms of diarrhœa and dysentery abound. Reliance should not be put on filters. When good milk cannot be obtained Allen & Hanbury's No. 1 food, or Horlick's malted milk, or condensed Swiss milk may be used. Some lime juice may be given to supply the antiscorbutic element.

Mothers and friends are very prone to give children chocolate, butter-scotch and all kinds of sweets to suck all day long. This promotes the coming of boils, which, with prickly heat, make the child's life miserable. To prevent boils scrub the child's skin all over every morning and evening gently with a nail brush and some mild soap, such as olive oil soap. This gently reddens the skin and keeps it healthy. A little lime juice given regularly helps to prevent prickly heat.

Round worms are very common in India and China, and the source of these is not clearly known.

Exercise.—Children can be taken out after birth in summer as soon as at home. Usually from 7 a.m. to 4.30 or 5 p.m., they have to be kept sheltered from the sun. Generally one side of the house will be free from sun in the morning and another in the afternoon. During the very hot hours they are put to sleep under a punkah, and they may, with great advantage, have the punkah going as they play under it in the house. In the cool of the evening they can play in some shady part of the compound. On the hills more latitude can be allowed, but the danger of chills must be avoided.

They must wear pith helmets (topees) to prevent sunstroke, which is much to be dreaded, and the back of the neck must be protected.

Vaccination in early life is of great importance, because the danger of infection is so great when small-pox is epidemic.

In malarial districts the children are given a grain of quinine daily and special care must be given to mosquito nets, and to the removal of the stagnant pools, &c., in which the insects breed.

On Sending Children to England.—The result of general experience seems to show that English children do not thrive well in tropical climates. Quite apart from the question of malaria they seem to miss the cold English seasons which help the development of the healthy, muscular, rosy-cheeked English child.

Anglo-Indian children do not thrive in India after early childhood, but become inert, pale, weak and weedy. Also they get harm morally from the native servants with whom they are brought into contact. The rule is to send them home between the ages of five and eight—earlier rather than later. But mothers may bring young babies back to India from England for the first few years of life.

In tropical **Africa** the conditions for the residence of Europeans are less favourable than in India. The wives of missionaries and others on the West Coast are usually sent home for confinement, for malaria is ruinous to infants. In Uganda and in East Africa they seem to do better, if the parents be well instructed and careful, and some young children are kept out for a few years; but, as in the case of India, they should be sent home after the age of five.

In **China**, the greater part being outside the tropics and there being much more cold season in the year, the rearing of Anglo-Chinese infants presents fewer difficulties, if scrupulous care be taken against food and water infection.

In the **West Indies** children seem to thrive very well in infancy and early childhood, but should be sent home after a few years.

CHAPTER VI.

ON THE MANAGEMENT OF NEWLY-BORN AND PREMATURE INFANTS.

SPECIAL CARE OF NEW-BORN CHILDREN.

Establishment of Respiration.—Immediately after birth, the mouth and throat must be thoroughly cleansed from mucus and other matter, and, if necessary, the child may be turned on its face for a few seconds to let any fluid run out.

If it does not begin to breathe and cry, the best artificial stimulus is to dash a few handfuls of cold water forcibly upon it, and to slap the buttocks smartly or flip them with a wet towel.

If this fail, commence at once *artificial respiration* on Sylvester's plan. This consists of two movements. Place the child on a pillow, as shown in Fig. 22, an assistant holding the feet. The process is best done in front of a warm fire.

First Movement—Inspiration.—Seize the arms at the elbow, pull them with firm traction above the head, rotating them gently outwards.

Second Movement—Expiration.—Bring down the arms and press them, with elbows bent, upon the chest with firm pressure.

Frequency of Movement.—Fifteen times per minute.

Continue until regular breathing is established, and do not abandon efforts to restore a child till some time after all occasional gasping has ceased, and the heart-beat has become quite imperceptible.

Auxiliary Measures.—Have two baths prepared, one at blood heat (100° F.), and one of cold water. Plunge the child into these for a few seconds alternately. If this is likely to do good there will be signs of respiration almost at once; of course the head is not immersed.

There are two classes of these non-breathing new-born children, the "blue-faced" and the "pale-faced." When the child is blue with semi-suffocation, it is more likely to live than when it is pale, limp, and lifeless looking. If, after the child has breathed well, it relapses into its former condition, the case is serious, for this often means that there is internal injury, especially of the brain.

When breathing continues to be weak and irregular for some hours after birth, we may make use of the couveuse with advantage (see p. 133). In the absence of this we may apply external heat, by laying the child in front of a very warm fire, wrapping it in hot flannels frequently renewed, and using hot-water bottles, and the same measures are useful in cases of general feebleness and want of vitality.

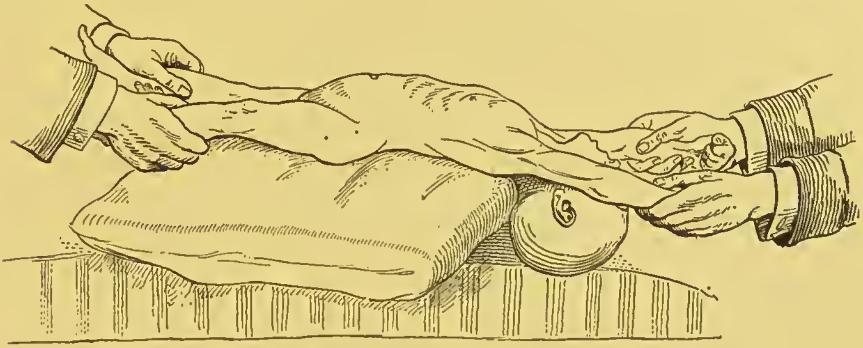

Fig. 22.—Artificial Breathing—Inspiration.

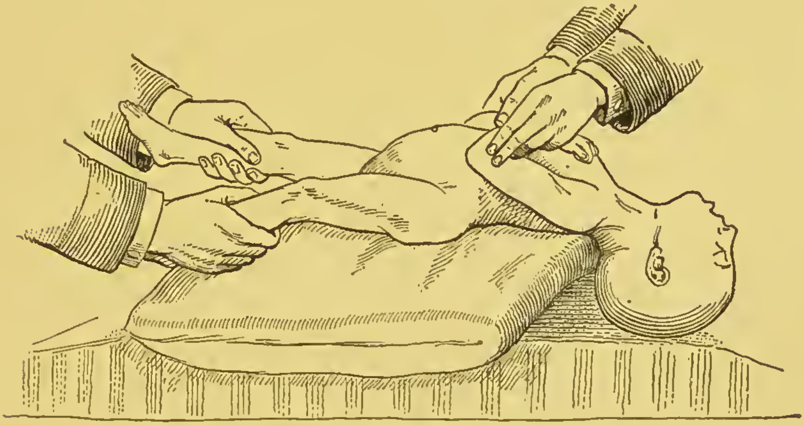

Fig. 23.—Artificial Breathing—Expiration.

Care of the Navel.—There is usually no urgency for tying the cord within a minute of birth. On the contrary, it is a good thing to wait till the pulsation in the cord has ceased for a minute or so (*Budin*). Tie the cord 2 inches from the navel.

Do not use a thin silk or other ligature which may cut the navel string. Several strands of worsted make a good ligature, for this is elastic, and will bind the cord tightly even if it shrinks a little, which a thick cord may do. If by any chance the cord bleed after division, it is easy to put a second ligature on the child's side of the first. To wound the infant elsewhere whilst cutting the cord is an act of unpardonable clumsiness, but it is not an unheard-of event.

After the infant is washed, the navel-string is best enwrapped in a square piece of dry boracic lint, which is preferable to moist or greasy dressing. A piece of clean, dry, soft rag will do if no boracic lint be at hand. It is then secured by a flannel band passed round the abdomen and fastened with a stitch. Avoid the common mistake of bandaging the chest and abdomen too tightly. It is of extreme importance that the navel-string, and the wound which it leaves when it falls, should be kept absolutely free from dirt, for wound infection and blood-poisoning can result from inoculation at the navel wound, and erysipelas and tetanus, for instance, can be so communicated.

There is reason to think that newly-born infants suffer from illness due to conditions of the navel, more frequently than is commonly recognised, and hence "surgical cleanliness" is imperative.*

We may add that any other sore on an infant may be infected by poisonous material. A case has been published, for instance, where a mother with a discharging whitlow infected her infant with erysipelatous inflammation, which attacked the genital organs, and spread to the body and thighs.†

The cord must be left to fall off, and must not be subjected to any pulling or twisting. Slight degrees of soreness and ulceration of the navel after the fall of the cord are best treated by a simple plan, which applies to very many superficial sores. 1. Cleanse thoroughly with warm water or antiseptic lotion. 2. Then dress with boracic acid ointment. 3. Cover with a little cotton wool and lint, and retain in place with straps of plaster. This plan keeps out the air, and prevents rubbing or chafing. The dressings must be renewed daily.

If bleeding occur after fall of the cord, it can usually be arrested with a pad of lint or cotton wool, fixed firmly with plaster strapping and a bandage. Occasionally the practitioner may have to apply a styptic, such as powdered alum, tannin, or adrenalin chloride, &c. Sometimes the navel protrudes unduly in a young infant, and constitutes the condition called *exomphalos.* This is not a serious matter, for it will almost invariably get well. It should not be treated by fixing a small conical pad over the rupture, for this acts like a wedge, and does not hasten cure. Elaborate navel belts are unnecessary. All that is needed is to strap the navel daily with plaster, after the bath, in the following way :—

---

* See an article by Erös of Buda Pesth, published in the *Archiv für Gynäkologie* (Band xli., Heft 3), "On observations on 1,000 newly-born children in regard to morbid conditions of the navel, and infection of the system produced thereby. The author published an abstract of this paper in the *Medical Chronicle*, April, 1892.

† Toujan, *Annales de gynécologie et d'obstétrique*, June, 1893.

Draw the abdominal wall together with the finger and thumb, both above and below the navel, so that the protrusion goes in and the navel is pressed out of sight. Then let an assistant apply one or two pieces of strapping from one side of the abdomen to the other, so that the navel is retained when the fingers are withdrawn. A cure will soon be obtained.

Prevention of Thrush (see p. 48).—1. The nurse must examine the child's mouth daily to detect the onset of the disease. Make this inspection while the child is crying during its morning ablution.

2. Scrupulous attention to cleanliness in the teat and bottle is the most essential precaution.

3. The ideal plan is to wash out the child's mouth after every time of feeding, using for this purpose a piece of clean, previously boiled rag, which is destroyed afterwards. The rag is moistened with a solution of borax, about 15 grains to the ounce. In a bottle-fed or delicate child this must be strictly enforced. In a healthy, vigorous, breast-fed infant, twice or thrice daily is quite sufficient, so long as there is no sign of thrush.

4. If the thrush appear, the rag must be dipped in Glycerine of Borax (B.P.), and the white spots must be carefully wiped away as far as possible.

5. The general health of the child must be restored by appropriate treatment.

After the first few weeks the liability to thrush is much less, but at the time of teething, or in wasting disease, it may be seen and must be treated as above.

Prevention of Purulent Ophthalmia.—Under certain circumstances, new-born children may suffer from virulent inflammation of the mucous membrane lining the eyelids and covering the front of the eye. This becomes red and inflamed, and the eyes discharge thick yellowish-white matter. The consequences of this purulent ophthalmia may be permanent opacity of the cornea, and even destruction of the eyeball. Fortunately the disease, if taken in time, is usually curable, and it is a disgrace to all concerned if, by neglect, the infant becomes blind. (See Fig. 24.)

The disease is due to contagion. The source of the contagion is almost always found in a more or less virulent discharge with which the mother has been affected at the time of delivery. A soiled towel, or sponge, &c., may bring the infection from the eyes of another child, or from some other source, and the nurse might infect her own eye from the child's by carelessness.

The treatment of this condition must be directed by a medical man, and carried out with the assistance of a nurse. The nurse's duty is in the first place to preserve perfect cleanliness in the eyes of the new born, by carefully washing away with a small piece of cotton wool any mucus or secretion that may collect in the corner of the eye, and to report instantly to the medical attendant the occurrence of the least sign of redness and inflammation on or within the lids. The surgeon will probably make an application to the diseased mucous membrane by dropping into the eye a few drops of a 2 per cent. solution of nitrate of silver. This has a specific action in destroying the micro-organism which causes the disease. He will then prescribe an antiseptic or weak astringent lotion (such as a saturated solution of boracic acid), and the success of the treatment will often depend on the diligence and efficiency with which the nurse washes away the discharge by cleansing the eye, by dropping

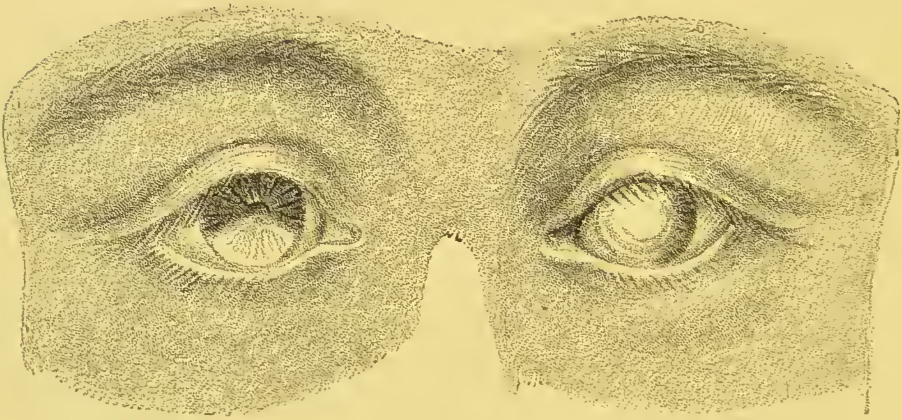

Fig. 24.—Eyes that might have been saved!
(Leucoma from neglected purulent ophthalmia.)

in the lotion, and wiping away the secretion with pledgets of cotton wool. All such pledgets must be carefully burned.

For full details of the treatment the student is referred to text-books of ophthalmology (*ophthalmia neonatorum, purulent ophthalmia, gonorrhœal conjunctivitis*).

In lying-in hospitals, to prevent the occurrence of an epidemic of this disease amongst the new born, it is common to adopt Credé's prophylactic. He advised that the eyes of *every* new-born child be at once washed with pure water, and that one or two drops of the 2 per cent. solution of nitrate of silver be dropped from a glass rod between the separated eyelids. This treatment has had a very potent effect in preventing the appearance of the disease in lying-in hospitals, and it is not often that the application has to be repeated. It is applicable to maternity charities in general.

CARE OF PREMATURE INFANTS.

In Chapter i. we have described the signs which indicate that an infant is prematurely born. Its first disqualification for living is that, whereas under normal conditions it would have remained for perhaps two months more in the womb at a temperature of blood heat, it is brought into the cold external air which it is ill prepared to resist. This is one great cause of death in premature children. In a new-born child there is a fall of temperature, which may be as low as 97°. This soon rises again in healthy infants, but the depression may persist and prove fatal in weaklings. Another cause of death is the feebleness of its functions, and especially its defective powers of sucking, swallowing, and digesting. A special study of the best method of combating these difficulties has been made by Tarnier, Budin, and others, and great success has attended their system of treatment. Of this we will now give some account, taken principally from the work of Tarnier, Chantreuil, and Budin, already referred to, and to the more recent work of Budin, translated by Dr. W. T. Maloney.

The Couveuse.—The deleterious effect of cold on the premature child can be combated by keeping the infant in a kind of warm chamber or incubator. In 1880 Tarnier introduced his first couveuse into the Maternity Hospital at Paris. His second was designed in 1883. It is simple and easily made. It consists of a wooden box 26 inches long, 14½ inches broad, and 20 inches high (see Fig. 26).

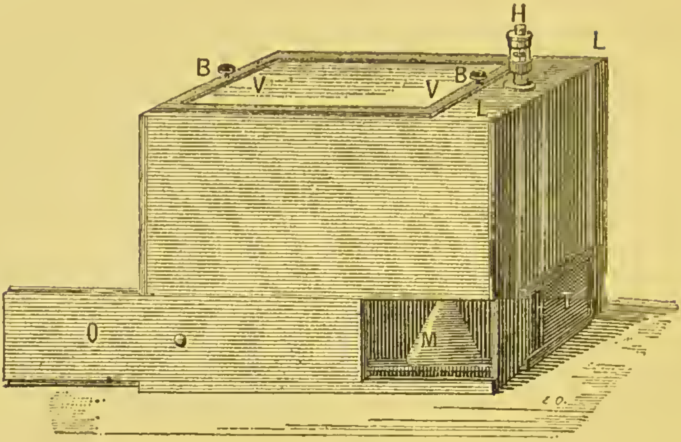

Fig. 25.—Tarnier's couveuse.

L, Cover of couveuse.
V, Glass pane in cover.
B B, Handles for lifting glass.
O, Sliding door.
M, Hot-water vessel.
T, Ventilation aperture.
H, Gyrating valve.

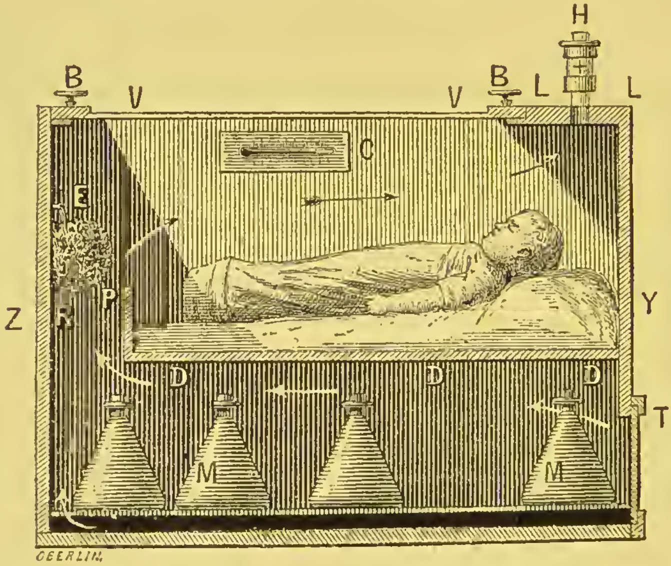

Fig. 26.—Section to show interior of couveuse.

V, Glass pane.
B B, Handles for lifting cover.
H, Gyrating valve.
C, Thermometer.
D Horizontal shelf.
R, Air passage.
E, Moist sponge in do.
P, Foot of shelf.
T, Ventilation aperture.
Y Z, Walls of couveuse.
M M, Hot-water vessels.

The cover of the box has a glass pane through which the infant can be watched, and a circular aperture about 1¾ inches in diameter, which is the outlet for ventilation, and which usually has a little vane to demonstrate the passage of the air current. The interior of the couveuse is divided into two compartments by a horizontal partition about 6¾ inches from the floor. This shelf does not reach to the end of the box, but leaves space of 2¼ inches for passage of air from the lower to the upper division. The infant lies on a little mattress placed on the shelf, the feet being towards the air space by which the two compartments communicate.

The lower compartment is opened by a sliding panel in one side. In one end of this compartment is the inlet for ventilation. This measures 4 inches by 2½ inches, and is partly closed by a sliding cover, which can thus regulate the amount of air. It can be opened to the full extent, but can never completely close the inlet. A thermometer is placed in the upper compartment, and a wet sponge or a small basin of water is put in the air space.

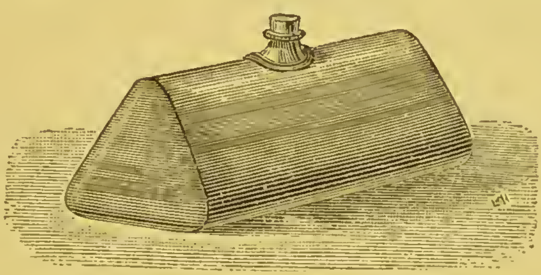

Fig. 27.—Hot-water vessel for warming couveuse.

The couveuse is warmed by means of stone bottles or cans of hot water. They are 8 inches long, and hold ½ litre each (0·88 pint). The chamber will hold five water bottles, but four are enough. It was formerly advised that the temperature of the couveuse should be between 31° and 32° C. (87·8° and 89·6° F.), but Budin now says that this is much too high, and that 25° to 26° C. (77° to 78·8° F.) is the standard for general use, the idea being to prevent loss rather than to actually supply heat.

To use the couveuse, commence by inserting three cans of boiling water. In half an hour or less the chamber will be warm enough to receive the child. The child is swaddled in French fashion. It should be lightly clothed, as shown in the figure, and free to move. With a very weak child, cotton wool may be used at first. In two hours insert a fourth bottle, and after that one bottle, the coldest, must be changed every one and a half or two hours.

Every hour, or every second hour, according as the case demands, the lid is removed, and the child is taken out to be fed or to be changed. While it is advisable not to expose the child to the air longer than is necessary, experience has shown that there is no special tendency in the child to take cold in such brief removals. This artificial incubation is usually continued for from one to two weeks, but it has been prolonged for forty days.

Indications for the duration of incubation may be gathered from the condition of the child. If he sleeps tranquilly in the couveuse, let him stay there. If he cries while in the couveuse, but is quiet when removed, he may be kept out, but should be replaced if he grows weak. Sometimes, after a sojourn in the couveuse, the infants become torpid and cease to gain weight, but will improve in condition and weight if the temperature be reduced.

When the child attains a weight of 2,280 to 2,300 grammes (5 to 5¼ lbs.), and provided that the room in which the incubator is placed is systematically heated, the temperature of the couveuse may be allowed to fall a degree at a time, from 24° to 20° C. (75° to 68° F.), after which it may be dispensed with.

When the new-born weakling has been chilled, as may happen in bringing it to the hospital, through delay in procuring the couveuse, a warm bath may be employed as an initial measure, with the best results. Budin says that the best way is to take the rectal temperature, and place the child in a bath one degree higher than this, and then during twenty minutes to increase the temperature of the bath gradually up to 37·5° C. (99·5° F.).

Massage is recommended by Budin in the treatment of puny children. The infant is undressed, placed in front of a warm fire. Then the fleshy parts of the limbs are gently rubbed and kneaded, and the joints gently moved, the nurse's hand being oiled for the purpose. This is continued for five minutes, two or three times in twenty-four hours.

Gavage, or Forced Feeding.—In 1851, Marchant of Charenton proposed to feed with an œsophageal tube new-born and premature infants, who were too weak to suckle properly. Fabbri was successful in treating foundlings in this way, and published papers in 1865, and Beluzzi and others also followed the plan with success. In 1884, Tarnier commenced to employ gavage for new-born infants, who could neither suck nor take the spoon.

The apparatus necessary is a small œsophageal tube, or red gum catheter, and a small funnel or graduated glass receiver (see Fig. 28).

The tube is No. 14 or 16. French catheter gauge. The distance from the infant's lips to the stomach is about 15 cm. (or 6 inches). To feed the child it is taken on the knee, with the head slightly raised. The tube is lubricated, introduced over the base of the tongue and passed into the œsophagus. The child will make a reflex movement of deglutition, which assists the passage of the tube. Milk is then poured into the funnel in quantity as indicated below, the tube being first compressed. Then the milk is allowed to gravitate into the stomach. The tube is withdrawn rapidly in order to prevent regurgitation.

Mother's milk is the best, and all possible precautions must be taken to secure cleanliness and asepsis. There is one danger in gavage. If too great an amount be used, the child quickly gains in size and weight, but this is chiefly due to œdema of the whole body. This will disappear when the amount of food is reduced. If it be not reduced, the œdema will be further complicated by gastritis and enteritis, to which the child may succumb.

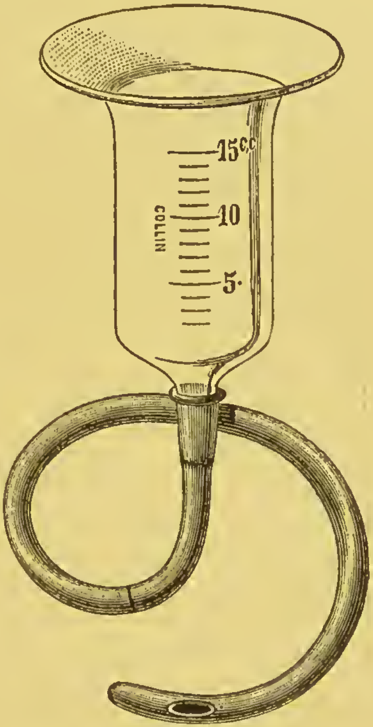

Fig. 28.—Apparatus for forced feeding.

Hence to succeed, milk must be given in small quantities at each meal, and the number of meals duly regulated, according to the table quoted.

In the case of new-born children who suckle badly and do not thrive, an alternation of suckling and gavage can sometimes be adopted with advantage. A similar alternation affords the best way of passing from the use of gavage to ordinary lactation. By the simultaneous employment of gavage and the couveuse, children born at the sixth month of pregnancy have been reared. For illustration we may mention three cases given in the work referred to, where (1) an infant of six months and one week who weighed 1,500 grammes; (2) an infant of six months and one week who weighed 1,100 grammes; and (3) an infant of six months who weighed 1,180 grammes, were successfully reared.

Amount of Food to be given to Weaklings.—Extreme care has been taken by Budin in observing the amount of breast-milk taken by weaklings. This varies with the weight of the infant, and the following table is given as a guide in the rearing of incubated children :—

TABLE FROM BUDIN, SHOWING AMOUNT OF MILK TAKEN DAILY IN FIRST TEN DAYS BY WEAKLINGS. CONVERTED TO POUNDS AND OUNCES.

	Infants weighing less than 1,800 grammes = 3·96 lbs. Average of 11 Infants	Infants weighing from 1,800 to 2,200 grammes = 3·96 to 4·84 lbs. Average of 31 Infants	Infants weighing from 2,200 to 2,500 grammes = 4·84 to 5·5 lbs. Average of 25 Infants
Day.	Grammes. Ozs.	Grammes. Ozs.	Grammes. Ozs.
2nd, . .	115 = 0·40	128 = 0·45	180 = 0·63
3rd, . .	160 = 0·56	175 = 0·61	236 = 0·83
4th, . .	210 = 0·74	226 = 0·79	295 = 1·03
5th, . .	225 = 0·79	308 = 1·08	335 = 1·17
6th, . .	250 = 0·88	324 = 1·14	370 = 1·30
7th, . .	280 = 0·98	335 = 1·17	375 = 1·32
8th, . .	285 = 1·00	350 = 1·23	385 = 1·35
9th, . .	310 = 1·09	380 = 1·33	415 = 1·46
10th, . .	320 = 1·13	410 = 1·43	425 = 1·49

After the tenth day the food is taken in larger quantity, and Budin says that, roughly speaking, a quantity rather more than a fifth of the body weight is required. If the child take too little, it will suffer from inanition and attacks of cyanosis. If overfed, it will have indigestion and diarrhœa.

It is extremely important to avoid all exposure to infectious disease, including influenza. Budin speaks of influenzal bronchitis spreading epidemically amongst infants. The success of the French clinique in rearing these premature children depends very largely on the use of mother's milk, and the supply of wet nurses when the child's own mother cannot suckle it.

The results obtained from the couveuse are very satisfactory in the case of premature infants; and the same treatment is also beneficial in the case of weakly full-term infants who suffer from cyanosis, &c., when twenty-four hours' incubation is often enough. Very much benefit has also been obtained in cases of scleroma.

Auvard says that before the couveuse was used, the mortality among infants weighing less than 2,000 grammes (4·4 lbs.) was 66 per cent., and that this has now been reduced to 36·8 per cent. by its employment.

At the Clinique Tarnier during 1898, of 30 premature infants weighing between 1,500 and 2,000 grammes, 26 (or 87 per cent.) were saved; and of 108 weighing between 2,000 and 2,500 grammes, 101 (or 93 per cent.) were saved.

Those who have to rear premature children should not fail to consult Budin's book, from which we have been able here to make but brief quotation.

CHAPTER VII.

ON THE SIGNIFICANCE OF CERTAIN CONDITIONS OBSERVED IN INFANCY.

The following notes and references are likely to be of use to the student.

Unusual Size of the Head.—This may be a more or less natural condition. It is common in rickets, when the head is broad and flat, and prominent at the frontal and parietal bones. It is also noted in hydrocephalus (dropsy of the head), when the whole head tends to be globular, and the sutures of the skull to gape. The head varies very much in size. At birth the circumference of the head is greater than that of the chest, but in the second year of life in a well-developed child there should be little difference; but in ill-developed children the chest may remain relatively too small for four or five years. The following table, relating to children of good development, is taken from Keating's *Cyclopædia*, vol. i., where it is quoted from the *Third Report of the Clinical Hospital, Manchester*, by Dr. James Whitehead:—

No. of Cases observed.	Age.	Girth of Head in Inches.	Girth of Chest in Inches.	Difference between Head and Chest.
100	1 day,	13·75	12·94	Head more than chest, 0·81
66	6 to 12 weeks,	15·25	14·25	,, ,, 1·00
75	6 to 8 months,	16·68	15·58	,, ,, 1·10
71	11 to 13 ,,	17·80	17·20	,, ,, 0·60
67	21 to 24 ,,	18·38	17·85	,, ,, 0·53
50	34 to 36 ,,	18·70	18·61	,, ,, 0·09
60	4 to 4½ years,	19·20	19·72	Chest more than head, 0·50
46	6 to 6½ ,,	19·51	20·76	,, ,, 1·25
40	9 to 10 ,,	19·56	21·31	,, ,, 1·75
31	11 to 12 ,,	20·00	23·46	,, ,, 3·46

Fontanelle—This is of large size, and closes late in rickets and in congenital syphilis, also in hydrocephalus. It is tense, hot, and throbbing in meningitis, but also in fevers in general.

SCHOOL OF MEDICINE,
UNIVERSITY OF LEEDS.

It is depressed after much diarrhœa and in chronic wasting disease.

Parchment-like Spots where the skull is thin and yields under the fingers, found chiefly posteriorly (*craniotabes*), are often seen when rickets is combined with congenital syphilis, but also in simple rickets. See valuable papers by Sir. T. Barlow and Dr. Lees in *Trans. of Path. Soc.*, vol. xxxii., p. 323, and by Dr. Baxter, p. 361; also Dr. Barlow's article on "Craniotabes" in Heath's *Dictionary of Practical Surgery.*

Profuse Sweating from the Head, an early sign in rickets. See Jenner's lectures on Rickets, *Med. Times and Gazette*, 1860. Not many lectures 48 years old retain their value in so great a degree as these.

Squinting in the early weeks of life may mean nothing (see p. 22). It is sometimes due to abdominal irritation and is one symptom of meningitis. It is associated with convulsions, may follow acute diseases, and is associated with congenital blindness, and in older children with defective vision.

Inflammation of the Eyelids with Purulent Discharge in the Newly Born.—See *Prevention of Purulent Ophthalmia*, p. 131.

Obstruction of the Nostrils (Snuffles) in Early Infancy.—This is one symptom of congenital syphilis. It is due to coryza. Discharges from nose and excoriation on lip and at corners of mouth are associated with this, and characteristic eruptions are also seen. The student is referred to well illustrated articles in Ashby and Wright's text-book, chap. xx., and Owen's *Surgical Diseases of Children.*

Habitually Sleeping with the Mouth Open and keeping the Mouth Open by Day.—This is a sign of nasal or pharyngeal obstruction. The child must be carefully examined for large tonsils and for post-nasal adenoid growths. Chronic obstruction in the respiratory passages impairs health and development, and deafness and defective mental acuteness are found associated with this condition. Removal by operation is necessary, and is often followed by a singular amount of benefit.

Marked Dilatation of the Nostrils at each inspiration is a sign of impeded respiration, but a slight degree is seen in the quickened breathing of fever.

Puffiness of the Eyes and the Root of the Nose.—As this may be an indication of renal defect, the urine must be examined for albumen, &c.

Paralysis of One Side of the Face for some time after birth. This is probably due to bruising of one side of the face by the blade of the midwifery forceps, which has compressed the facial nerve. It may also occur after labours prolonged and difficult, but otherwise apparently normal (*Henoch* and others). The prognosis is usually good. See vol. iv. of Keating's *Cyclopædia*, p. 804.

Enlarged Glands.—If under jaw and in the side of the neck, look for carious teeth, sore throat, and eruptions on ears, face, and scalp. If at nape of neck or behind the ears, examine scalp for skin eruptions and for *pediculi* (lice).

Late teething is common in rickets.

Gums, spongy, swollen, bleeding. See *Scurvy*, p. 52.

The child constantly **oscillates the head,** throwing it back and burrowing in the pillow. Sign of pain in the head, but may be due to ear-ache.

A swelling on the head of the new born, which lasts for weeks, and becomes very hard. See *Cephalhæmatoma*, p. 4.

A considerable **swelling on one side of the neck,** especially the right, found *at birth* or soon after, and becoming very hard at a subsequent period. This is hæmatoma of the sterno-mastoid, a very rare condition. There is a good account of this in Henoch's work, part i., section 4. The prognosis is very favourable.

For **swelling of the Mammæ** and **Mastitis neonatorum** see p. 15.

Loss of Power in one Arm or one Leg.—This is very likely "infantile paralysis," but before coming to such a conclusion, remember that it is possible that the child may have bruised the part by a fall, or that the limb may have been wrenched by careless lifting or by forcing it into a sleeve at an awkward angle. Occasionally such a condition is produced during birth, especially in pelvic presentations. See Ashby and Wright, *op. cit.*, p. 23, *Obstetrical paralysis.* Amongst the injuries produced by rough lifting, &c., we may mention subluxation of the head of the radius from the orbicular ligament (M'Nab's displacement. See Heath's *Dictionary of Surgery*, art. "Dislocation of Radius," and Lindeman, *Brit. Med. Journ.*, August, 1885).

Bent Collar Bones, common in rickets; but if on one side only, perhaps due to an overlooked fracture.

Series of Beads on the Ribs, rickety rosary (see p. 56). Pigeon breast, ribs sinking in at the sides of the chest at each inspiration—all common effects of rickets.

Clubbing of the Ends of the Fingers means some obstruction to the circulation in chest. It is seen, for instance, in congenital heart affections, and in tubercular lung disease.

A cystic swelling in place of one or more vertebral spines; a birth defect in the spinal column, *spina bifida.* See Heath's *Dictionary of Surgery.*

General Weakness of the Spine, so that there is a uniform roundness of the back and shoulders when the child sits up, but the spine becomes quite straight when the child is laid horizontally on its face. The mother is probably alarmed, and says that the spine "is growing out." This is due to weakness of muscles and ligaments, and is common in rickety and debilitated children, and must not be confused with angular curvature from diseased bone.

The Feet Turn in, the Knees tend to Knock.—This again is often due to weak muscles and relaxed ligaments, and must be distinguished from deformity due to contracted tendons or curved bones.

When a child who has once walked ceases, without obvious cause, to be able to do so, this is strongly suggestive of the onset of rickets. So is lateness in beginning to stand and walk.

If a child in its third year show no power of talking or walking, and be also helpless with the hands, this is probably a case of brain defect, and very many of such cases are caused by injury to the head during birth. The class of *mentally deficient children* include many such.

Abdominal Distension.—The most *serious* causes of such distension are tubercular peritonitis and mesenteric disease. The public have some idea of this, and a large number of those infants who have large bellies and much diarrhœa are erroneously supposed by their mothers to be suffering from "consumption of the bowels." The most *common* cause is distension from flatulent accumulation, especially in rickets, when the abdominal walls are weak, the intestinal wall deficient in tone, and the digestive processes disordered. In fact, "pot-belly" is a characteristic sign of this disease. The abdomen under such circumstances often shows a furrow along the central line, and here the recti muscles yield and separate, and when the child tries to sit up there may be a bulging of the intestines between them.

Swelling in the Groin may be due to inguinal hernia, but possibly is due to a descending testicle. Enlarged glands are not uncommon, especially when there is irritation in and around the genital organs.

Inguinal Hernia, or rupture in the groin, is sometimes seen in male infants. It is due to the fact that the passage by which the testicle descended has not yet closed. If a proper truss be applied at once, permanent cure may be obtained. Trusses covered with waterproof material are made for infants. The idea that the child is too young to wear a truss is most erroneous. Before applying the truss, make sure that the swelling is not an undescended testis. The operation for permanent cure of hernia is being now more frequently performed in children, and it is a good way of saving much trouble and some possible risk in the future.

Cleft Palate.—When infants with cleft palate are unable to take the breast because the malformation of their mouths prevent proper suction, there may be some difficulty in feeding them.

Sometimes they can be successfully fed with the spoon, the child being supported in an upright position for feeding; also compressing the nostrils may assist swallowing. Or we may employ a very large teat which, when placed in the mouth, will obstruct the cleft in the palate. The apertures in the teat are made in the lower side of the teat, so that the milk flows into the mouth. An ingenious and simple appliance is described by Mr. Oakely Coles in his work on *Deformities of the Mouth.** It is made by attaching to an ordinary indiarubber teat a flap of indiarubber, which shall fit against the palate during sucking. This is said to succeed sometimes, but it does not seem to enable the child to take directly the mother's breast milk.

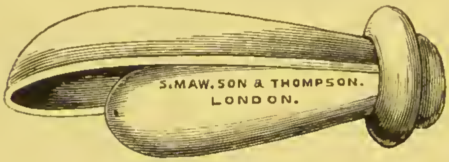

Fig. 29.—Nipple with false palate.

We show a form of nipple for cleft palate sold by Messrs. Maw. The flap may be made larger or smaller as the case requires, and the nipple should be of a good size (see Fig. 29).

As soon as the child is old enough the surgical operation for cure should be performed.

Rashes on the Skin.—We will only mention here that gastro-intestinal irritation in infants is very apt to be associated with papular rashes on the skin. These will consist of small raised round spots or little wheals. The student may refer to text-books under the heads of Strophulus, Lichen infantum, Lichen urticatus, &c.

**Deformities of the Mouth*, &c., by James Oakley Coles. See also on Cleft palate, in *Operations of Surgery*, by Jacobson.

"Red-gum" is the popular term for Strophulus. Erythematous rashes, especially when there are raised and reddened patches of skin, are associated commonly with rheumatism, and the heart, &c., must be carefully examined. See Dr. Cheadle's work on *The Rheumatic State in Childhood.*

The roseolous rash of syphilis must also be borne in mind, and the mucous tubercles and soreness and fissures around the anus which accompany this disease.

Phimosis.—The prepuce in the male infant should be capable of complete and easy retraction, and it is important that within the first month complete retraction should be made. If this be neglected, there may be a collection of secretion beneath the prepuce, and the prepuce may become somewhat firmly adherent to the glans. When the prepuce cannot be retracted, the condition is called *phimosis.* A long list of serious evils has been attributed to this condition. Amongst the most certain we may mention local uncleanliness, irritation, and inflammation, nocturnal incontinence of urine, and a tendency to the production of bad habits and moral evils in boyhood and youth; also hernia, bladder symptoms, falling of the rectum, and certain nervous conditions. It must, however, be remembered that a certain degree of phimosis is natural in the male infant. If the prepuce be drawn back with the fingers, and adhesions broken down, and if subsequently it be retracted systematically, in many cases there will be no further difficulty.

But mere dilatation will by no means always succeed, and a long pendulous prepuce is in itself an evil, and in such cases it is best to have the child circumcised by a surgeon. The old rite of circumcision had a sound hygienic basis, and the operation is often performed for such reasons with great advantage in the present time.

"Growing Pains."—This is a vague, unsatisfactory term. The painful region must be examined. The cause is often rheumatism.

Marked Pallor and Anæmia, in absence of obvious disease, may be due to want of fresh air and of sunlight, to over-heated rooms, bad sanitary conditions, and to many other causes. It may be due to deficiency of nitrogenous material in the diet; if so, great improvement will follow the use of meat juice, &c. This will sometimes effect a cure, even without cod-liver oil and iron.

Bleeding from Vagina, and perhaps from the rectum also, may occur in the early days of life. It is attributable to congestion in the pelvic veins consequent upon ligature of the cord, and is not a serious symptom.

Catarrhal Discharge from the Vulva may be due to want of cleanliness or local infection in little girls, and there may even be a considerable amount of vulvitis. An unjustified suspicion of foul play is sometimes raised by this condition.

Blood in the Urine is one sign of scurvy (see p. 52).

Black or very Dark Motions.—On meconium, see p. 11. May be due to iron or bismuth taken as medicine, or to digested blood. The source may be blood swallowed by the infant, as from a fissure in the mother's nipple, or there may have been hæmorrhage from the child's own nose or mouth. Occasionally may be caused by ulceration in stomach or bowels, and is then of very grave importance. Refer to authorities under heads of Melæna neonatorum and also Hæmophilia neonatorum. See, for instance, Winckel's *Midwifery*, Part viii., chap. xii.; Ashby and Wright, *op. cit.*, chap. ii.; Goodhart, *op. cit.*, chap. iv.

Green Motions.—Motions of this colour are often seen when there are irritation and indigestion in the stomach and intestines, and some gastro-enteric catarrh. The exact cause is disputed.

Expectoration is *not* a symptom in infancy. An adult with bronchitis will expectorate freely; an infant will not do so at all. It may, however, swallow its phlegm and subsequently vomit it.

Crying continually without obvious cause. Here is a short list of possible reasons.

1. Hunger and thirst.
2. Indigestion, flatulence, and stomach-ache are exceedingly common causes.
3. Cold. The extremities may be chilled. The bed clothes may be inadequate.
4. The child may be over-heated by clothes, and may feel hot and uncomfortable.
5. Cramp from lying long in one position.
6. Some constriction by dress, a pin pricking, crumbs in the bed.
7. Ear-ache.
8. Pain from teeth.
9. *Malaise*, and head-ache from some rise of temperature.
10. Urinary troubles, phimosis, and local irritation.
11. Rheumatic pains.
12. Recent fall, or strain, or bruise overlooked.
13. Bites and stings of insects.
14. Temper because it cannot get its own way.

APPENDIX I.

WORK OF THE HEALTH VISITOR.

As the former edition of this work has been found useful by various "health visitors" and inspectors, this Appendix is introduced for the purpose of increasing its usefulness in this direction.

The following schedules, founded on some in actual use, are for the routine inspection of infants in their homes :—

No. 1.—Infant Inspection Schedule.

No. on Register...........Ward.......................District.......................
Name................................Son (or daughter) of................................
Residing at............................Whether legitimate or not....................
Visited on..................................by...
Date of birth.............................Whether attended by doctor (name) or midwife (name).
Age of mother...........Previous confinements and miscarriages..............
Present state of health of mother............. ....
Occupation during pregnancy, and date when relinquished...................
Date of resumption of work after delivery...
How child has been fed—
    Breast alone from.........to.........Breast and bottle from.........to...... ..
    Bottle only from.........to.........Bottle and other food....................
If weaned, when and why.. ....
Present condition of child..
Where the child sleeps, whether separate cot...
By whom nursed in mother's absence...
How clothed..
Date of vaccination...
Cleanliness of child and surroundings...
Room and inmates...........House............Sanitary appliances.................
Cleanliness......................Nuisances..................... ....
Subsequent inspections, with dates and findings....................................

No. 2.—Schedule for Investigation of Cases of Infant Death.

Name of visitor..............................Date..................................
Name, age, and sex of deceased...............Address of parents.................
Registered cause of death.................Date of death..........................
Occupier and owner of house in which death occurred, whether any trade is carried on therein...
Details concerning air, light, ventilation...
Whether "through" or "back-to-back" house..............Details as to size, rooms, storeys, number of inmates ....Signs of dampness..... ......
Details concerning drainage:—Sink, other drains, rain-water pipes, closet, ashpit, street gullies.....................Water supply.......................
Nuisances.......................Other sanitary matters..............................

Concerning Mother of Child.

Age.........Previous labours, abortions, and premature deliveries..............
Whether married, unmarried, or widow...
Mother's work before and after marriage..
How late discontinued before labour.................. ....
How soon resumed afterwards ....
Notes on health of parents and family...
How many other children, living and dead.................................. ....

Concerning Deceased Infant.

Whether premature or full term..
Notes on previous illnesses and on last illness........................ ....
How the infant was fed, whether wholly or partly at the breast...............
Whether wholly or partly weaned (with dates)........... ....
Health and regimen of mother while nursing, whether drugs, &c., taken......
Kind of feeding-bottle used, and whether properly cleansed......... ....
Source of milk supply..........................Whether milk was boiled or not, and where kept..
Whether there was any obvious source of milk contamination..................
Whether condensed milk or any other kind of food was used..................
How prepared and kept.................Remarks on diet............................

In making such enquiries, the table in Chap. ii., p. 54, will be found useful.

NOTES FOR HEALTH VISITORS.

In the Case of Mothers who are Suckling.—The most important points are to encourage perseverance in suckling, and to help them with initial difficulties, such as sore nipples, and to urge them not to give the infant anything else. To recommend fixed times for suckling. For this purpose a "Breast-feeding" leaflet is given and explained. The evil of feeding whenever the child cries should be pointed out. Inflamed eyes require immediate medical attention. For prevention of thrush see p. 131. Prevention of overlying by use of separate cot, cleanliness, mode of bathing, care of septic navels, attention to sore and excoriated parts, avoidance of drugs, of soothing syrups, and of comforters, are other important matters. Advise mother on her own diet and regimen, and against too early return to work. Also advise seeking medical aid for beginnings of disease. Caution mothers not to make the infant sit up in early months.

In Cases of Hand-Rearing.—Advise partial feeding as against complete weaning. Advise where to obtain good milk, if depôt be available. Give "Hand-rearing" leaflet, and advise as to plan of feeding according to means (see Chap. iv.). Inspect bottle, condemn bad varieties, and show how to keep clean and sweet. Explain, in detail, preparation of food; advise where to keep it. Urge importance of seeking medical aid for slight ailments, and especially beginnings of summer diarrhœa. Caution against giving scraps from parents' table, and against tea and spirits. Urge regular weighing. If the child be not thriving, study table on p. 54 with regard to case in question.

In Case of Infants Nine Months Old and onwards.—The third leaflet should be given. Advise seeking medical aid when child is not thriving, especially for convulsions, diarrhœa, and bronchitis, and caution mother against neglecting symptoms "because the child is teething." Fresh air, exercise, child's clothing need notice. Caution against fire, also against keeping child up late. Sec also the various points of hygiene mentioned in Chap. v.

APPENDIX II.

EXAMPLES OF HEALTH LEAFLETS.

After examining a great many, I think I cannot do much better than give the three following examples of (1) a **Breast-feeding Leaflet,** (2) a **Hand-feeding Leaflet,** and (3) a **Second-year Leaflet,** respectively.

They are in use at the three principal medical charities in Leeds, and were prepared by my colleague, Dr. W. H. Maxwell Telling.

No. 1.—BREAST-FEEDING LEAFLET.

Name of Patient,..

Age,........................ *Date,*........................

Breast Feeding.

1. Every child should be fed by the breast alone until it is eight months old. The only exceptions to this rule should be—(1) If the mother has no milk; (2) If the doctor orders it.
2. Begin to wean at eight months; remove entirely from breast at twelve months.

(N.B.—Neglect of this last rule only causes the health of both mother and child to suffer, and does not prevent the mother again becoming pregnant.)

3. A healthy child may be allowed to suck till it is satisfied, remaining longer at the breast as it increases in age. If it sucks too greedily, causing indigestion or vomiting, this may be prevented by compressing the nipple between two fingers.
4. The nipples should be washed before and after nursing, and rubbed with a little methylated spirits.

	How Often.		Number of Feeds in 24 Hours.
	During Day.	During Night (10 p.m. to 7 a.m.).	
During 1st month, . .	Every two hours.	Every four hours (two feeds).	10
During 2nd month, . .	Every two and a half hours.	Every four hours (two feeds).	8 or 9
Then gradually increase times between feeds.			
During 3rd, 4th, and 5th months,	Every three hours.	Once or twice.	7
Now cease night-feeding altogether.			
During 6th and 7th months,	Every three hours (six feeds daily).	Nothing.	6
When eight months old begin to wean.			
During 8th and 9th months,	Three meals of breast milk, Two of cow's milk.		5
During 10th and 11th months,	Two meals of breast milk, Three of cow's milk.		5
At twelve months old wean entirely under all circumstances			

After Eight Months.—Those meals which are not from the breast may consist of pure milk, which should be boiled, or the same thickened with bread, rusks, baked flour, or some good prepared food.

These feeds may be given from a bottle, or from a spoon, especially if the child "bolts" its food.

The kind of bottle, and the way it is cleansed, are most important:—

(*a*) *The Kind of Bottle.*—It must have no tubes; the teat must fit directly on to it. (The boat-shaped bottle, with tablespoonful markings, will be found most useful.)

(*b*) *The Cleansing.*—Wash at least once a day in boiling water, to which a little washing-soda has been added, and then rinse in cold water. Rinse after each feed, and keep under cold water. Boil the teats daily and turn them inside out.

Mixed Feeding.—If mother's milk be scanty, or if the baby be not thriving on it (and it has been suckled regularly), it is still to be suckled twice a day—night and morning—and is not to be removed from the breast altogether. The other feeds are to be prepared according to the directions under hand feeding, for which a paper may be obtained.

Remember.—That all meals, breast or hand, must be given regularly, by the clock. Never feed a baby just to keep it quiet, and it should never be left to take its food by itself.

The following points are also of the *greatest importance*:—

1. Every child should be washed all over with soap and water daily.
2. Loose flannel or knitted drawers should always bo worn outside napkins, &c. Always keep the child warm.
3. A child should have as much fresh air as possible, and should be taken out every day. It should sleep out of doors as much as possible.
4. Don't give young children "the same as we eat ourselves." Beer, spirits, wine, new bread, currants, unripe fruit, tea, and coffee, as well as many other things, are all very harmful.
5. Don't give "soothing syrup," or "teething powders," or, in fact, any medicine whatever, without a doctor's orders.
6. The sucking of "dummy teats" is harmful.
7. Babies should not be rocked to sleep.
8. Most *patent foods are harmful* for young babies; they should never be used except under doctor's orders.
9. The diet and care during the second year of life are equally important in the rearing of a strong, healthy child. (Paper may be obtained.)

No. 2.—HAND-FEEDING LEAFLET.

Name...

Age............................ *Date*....................................

Hand-Feeding.

1. As soon as the milk is obtained, prepare the "Milk-mixture" for the day as follows:—Boil for one minute, then cool rapidly and add to each pint 8 tablespoonfuls of fresh skimmed cream (or, better still, 2 tablespoonfuls of separated cream) and 4 level tablespoonfuls of white sugar (or, better, milk sugar—of any chemist). Then cover it up and stand in a cool place.
2. Add to each feed, just before giving it, the proper quantity of barley-water (or lime-water) shown in the table below.
3. When the feed is made, warm before using.
4. Never give milk that is not perfectly sweet at the time of using.
5. *Remember.*—The meals must always be given regularly, by the clock. Never feed a child just to keep it quiet, and it should never be left to take its food by itself.

	How Often.		How Much.
	During Day.	During Night. (10 p.m. to 7 a.m.)	
1st month	Every 2 hours	2 feeds	1½ tablespoonfuls of milk-mixture with 2½ tablespoonfuls of barley- or lime-water
2nd month	Every 2½ hours	2 feeds	2 tablespoonfuls of milk-mixture with 3 tablespoonfuls of barley- or lime-water
3rd month	Every 3 hours	2 feeds	2½ tablespoonfuls of milk-mixture with 3½ tablespoonfuls of barley- or lime-water
4th month	Every 3 hours	1 or 2 feeds	3 tablespoonfuls of milk-mixture with 4 tablespoonfuls of barley- or lime-water
5th month	Every 3 hours	1 feed	4 tablespoonfuls of milk-mixture with 5 tablespoonfuls of barley- or lime-water
Now cease night feeding altogether.			
6th and 7th months	Every 3 hours (6 feeds daily)	Nothing	7 or 8 tablespoonfuls of milk-mixture with 4 tablespoonfuls of barley- or lime-water
8th and 9th months	5 meals a day	Nothing	11 or 12 tablespoonfuls of milk-mixture with 4 tablespoonfuls of barley- or lime-water 2 meals may have a little baked flour or rusks added.
After 10 months apply for next feeding paper.			

The child may be fed from a bottle—or from a spoon, especially if it "bolts" its food.

The kind of bottle and the way it is cleansed are most important.

The Kind of Bottle.—It must have no tubes ; the teat must fit directly on to it (the boat-shaped bottle with tablespoonful markings, will be found most useful).

The Cleansing.—Wash at least once a day in boiling water, to which a little washing-soda has been added, and then rinse in cold water. Rinse after each feed, and keep under cold water. The teats should be turned inside out and boiled daily.

Care of the Milk.—It must be absolutely fresh and pure (not skimmed or separated). Get it twice a day from the largest and best dairy in the neighbourhood. Do not get it from one cow. As soon as you get it add the cream and sugar as directed.

Condensed Milk.—This should only be used by doctor's orders—most brands are unsuitable for infant's food.

To make Barley-water.—Take 1 teaspoonful of prepared barley, in powder, add it to 1 pint of boiling water, boil for five minutes. Make fresh every day—it will not keep. Keep covered, in a cool place.

Mixed Feeding.—If mother's milk be scanty, or if the baby be not thriving on it (and it has been suckled regularly) it is still to be suckled twice a day—night and morning—and is not to be removed from the breast altogether.

The following points are also of the *greatest importance*:—

1. Every child should be washed all over with soap and water daily.
2. Loose flannel or knitted drawers should always be worn outside napkins, &c. Always keep the child warm.
3. A child should have as much fresh air as possible, and should be taken out every day, unless the weather is very bad. It should sleep out of doors as much as possible during the day.
4. Don't give young children "the same as we eat ourselves." Beer, spirits, wine, new bread, currants, unripe fruit, tea and coffee, as well as many other things, are all very harmful.
5. Don't give "soothing-syrup," or "teething-powders," or, in fact, any medicine whatever, without a doctor's orders.
6. The sucking of "dummy-teats" is harmful.
7. Babies should not be rocked to sleep.
8. Most *Patent Foods are harmful* for young babies—they should never be used, except under doctor's orders.
9. The diet and care during the second year of life are equally important in the rearing of a strong, healthy child (paper may be obtained).

No. 3.—SECOND-YEAR LEAFLET (including End of First Year).

Name of Patient........................ *Age*.. ...... *Date*..........................

10 to 12 Months.	12 to 18 Months.	18 Months to 2 or 2½ Years.
Breakfast. Time: 7 a.m. A cupful of new milk, with either a tablespoonful of some good patent food, or a teaspoonful of Chapman's flour (baked); or, a cupful of Benger's food.	*Breakfast. Time: 7.30 a.m.* A rusk, or slice of stale bread, well soaked in a breakfast cupful of milk; or, a breakfast cupful of milk and a slice of bread and butter. Occasionally, instead of these, may be given a teacupful of milk, with the yolk of one egg, lightly boiled, and a thin slice of bread and butter; or, a breakfast cupful of milk with a teaspoonful of boiled oatmeal (or Quaker oats); or, a breakfast cupful of bread and milk.	*Breakfast. Time: 7.30 a.m.* A breakfast cupful of milk, with thin bread and butter, with the yolk of one egg lightly boiled: or, with bread soaked in bacon fat. Sometimes, instead of these, thin porridge may be given, and a little cream may be added to it.
2nd Meal. Time: 10.30 a.m. A cupful of warm milk, with a teaspoonful of pearl-barley jelly (thoroughly boiled barley) and white sugar.	*2nd Meal. Time: 11 a.m.* A teacupful of milk, with a rusk, or thin slice of bread and butter.	*2nd Meal. Time: 11 a.m.* Cup of milk, with rusk or biscuit.
3rd Meal. Time: 2 p.m. The yolk of one egg beaten up in a teacupful of milk and sweetened with white sugar.	*Dinner. Time: 1.30 p.m.* *At first (12–15 months).*—A teacupful of broth or beef tea and a tablespoonful of either custard, junket, or milk pudding. *Later.—There may be given every other day* a tablespoonful of well-mashed potato (baked) or well-cooked cauliflower, soaked in red gravy, with two tablespoonfuls of milk pudding. *To drink* (if required), give fresh water, or toast and water.	*Dinner. Time: 1.30 p.m.* A tablespoonful of pounded underdone toast mutton, and a potato well mashed with red gravy, and a saucerful of milk pudding, or custard, or junket; or, on every other day, a cupful of beef tea, in which some vegetable has been stewed, with thin bread and butter, and a saucerful of milk pudding. Occasionally, pounded fish may be given instead of pounded mutton. *To drink*, give fresh water, or toast and water.
4th Meal. Time: 5.30 p.m. As the 2nd meal.	*4th Meal. Time: 5.30 p.m.* A cupful of milk, with bread and butter, or a slice of bread soaked in it.	*4th Meal. Time: 5.30 p.m.* A cupful of milk, with bread and butter, or a stale sponge-cake.
5th Meal. *Time: 10 to 11 p.m.* As the 1st meal.	*5th Meal. Time: 11 p.m.* (or later), and *only* if the child wakes. A cupful of milk, to which a tablespoonful of some good patent food may be added.	*No* regular meal is now to be given, but a drink of milk, if required, in the late evening or night.

Remember.—1. That up to two years the principal food of a child should be milk, or things made from it. If a child is found to be unable to take some of the additions suggested in the above table, it will probably thrive so long as it takes plenty of milk.

2. If it wakes in the morning some time before its breakfast hour, it is not to go hungry till that time, but to have a drink of warm milk given immediately, if required.

3. After two years, meat or fish should be given, for dinner, once daily.

4. It is to have nothing between meals; no tea or coffee; no breast-feeding after 12 months. These points are most important, and only too frequently neglected.

5. Every child should be washed all over with soap and water daily.

6. Loose flannel or knitted drawers should always be worn outside napkins, &c. Always keep the child warm.

7. A child should have as much fresh air as possible, and should be taken out every day. It should sleep out of doors whenever possible.

8. Don't give "soothing syrup" or "teething powders," or, in fact, any medicine whatever, without a doctor's orders.

9. The sucking of "dummy teats" is harmful.

10. Babies should not be rocked to sleep.

APPENDIX III.

SIGNS OF DISEASE IN THE FIRST TEN DAYS OF LIFE.

THE schedule issued by the Central Midwives' Board requires acquaintance with "**The Signs of Disease in the First Ten Days of Life.**" It may be convenient that these should be summarised in this place.

1. Signs of imperfect respiration after breathing has been once fully established—weak, feeble, irregular breathing. This may be due to imperfect expansion of the lungs or to birth injury of the head. See p. 128.
2. Cyanosis (blueness due to heart defect). See p. 8.
3. Inflamed eyes (*Ophthalmia neonatorum*). See p. 131.
4. Thrush and soreness of mouth. See p. 131.
5. Signs connected with navel:—Offensive smell, redness, discharge, ulceration, hæmorrhage, with rise of temperature. See p. 129.
6. Chafing, soreness, excoriation of genital organs or other parts.
7. Signs of congenital syphilis:—Snuffles, sores, &c., at anus; rash on skin.
8. Trivial skin rashes, such as "red gum" (lichen); occasionally more serious conditions, such as hardened patches of skin, inflamed swollen areas or large blebs. Medical aid is imperative in such serious states.
9. Jaundice in new-born—usually trivial. See p. 6.
10. Convulsions; usually due to birth injury of the head, but may be caused by stuffing the stomach of the new-born with indigestibles.
11. Lockjaw in the new-born (*tetanus*)—practically unknown in England, seen in tropics.
12. Inflamed breasts. See p. 15.
13. Occasional hæmorrhage. See p. 145.
14. General atrophy, wasting without obvious cause—often due to congenital defect or to navel infection.
15. Vomiting and diarrhœa, due to wrong feeding.

Health visitors will find the following book very useful on account of its simple style and plain practical teaching:—*The Preservation of Infant Life: A Guide for Health Visitors.* By Emilia Kanthack. H. K. Lewis. Price 1s.

Mrs. Watson's pamphlet, entitled *Lessons on the Care of Infants* (*for use in Schools*), 12 pages, price one penny, is very good of its kind. Copies may be obtained from B. Broadbent, Esq., M. A., J.P., Huddersfield.

Reports and pamphlets on the working of the "Huddersfield Scheme" may be obtained from the Sanitary Office of the Corporation of Huddersfield.

A comprehensive syllabus of lectures on Infant Management is given by Dr. Niven in the *Report of the National Conference on Infant Mortality, 1906*, where many valuable suggestions will be found.

INDEX.

A

ABDOMINAL distension, 143.
Ablution in nursery, 116.
Acquired lesions not hereditary, 40.
Adenoids obstructing breathing, 141.
Africa, English children in, 127.
Albumen water, 86.
Alcoholism, relation to infant mortality, 40, 64.
Alcohol to be avoided in suckling, 79.
,, not to be given to infants, 103.
Anæmia, 145.
Antiseptic power of new milk, 70.
Arrowroot, 101.
Artificial feeding, 82 ; Frequency of, 91 ; Quantity to be given, 91 ; Summary of, in first nine months, 104 ; in tropical countries, 126.
Artificial milk-foods, 94.
Asphyxia of new born, 128.

B

BABY farming, 64.
"Back to the breast," 45.
Barley, 100.
,, water, 85.
Bathing, 116.
Birth marks, 5.
Biscuit foods, 100.
Black motions, 146.
Bleeding in new born, 145.
Blood in urine, 53.
Blue disease (Morbus cæruleus), 8.
Bones in rickets, 48.
Bony system, 15 ; Ossification of, 16.
Brain, Functions of, 19, 23.
Bread and milk, 100.
Breast, Abscess of, in new born, 15.
,, feeding, see *Suckling.*
,, milk, Microscopic examination of, 78.
,, ,, Quality of, 77.
,, ,, Quantity of, taken by infant, 73.
,, pump, 75.
Budin, *Consultations des Nourissons*, 68.

C

CAPUT succedaneum, 4.
Carbohydrates, Essential element of diet, 84.
Casein, Proteid element in milk, 82.
,, Removal of, 92.
Causes of infant mortality, 39.
,, why infants fail to thrive, 54-56.
Child psychology, Works on, 23.
China, English children in, 125-127.
Churchill's bread jelly, 100.
Circulation changes at birth, 8.
Circumcision, 145.
Cleanliness in nursery, 116.
Cleft palate, 144.
Climates, tropical, Rearing of English children in, 124.
Clothing, 118 ; in India, 125.
Collar bones, Bent, 142.
Colostrum, 11.
Comforters, Ill effects of, 110.
Condensed milk, 93.
Constipation, Diet in, 108.
Convulsions, 54.
Corn flour, 101.
Couveuse, 133, 135.
Cow's milk, see *Milk.*
Cowsheds, Unhealthy, 65.
Craniotabes, 141.

Cream, 84, 86.
  ,, Gravitation, 86.
  ,, Separated, 86.
Crèches, 60.
Crying, Causes of, 146.
"Cry of the children," 40.

D

DEATH rate, see *Infant mortality.*
Deciduous teeth, 26; Hygiene of, 121.
Defects and malformations, 5.
Dentition, 24, 122.
Development reached in two years, 31.
Diarrhœa, Diet in, 198.
Diarrhœal diseases, 37, 47.
Diet after weaning, 105.
  ,, at nine to ten months, 106.
  ,, at twelve to eighteen months, 107.
  ,, at eighteen months to two years, 107.
  ,, at third year, 107.
  ,, General notes on, 109.
  ,, in constipation, 108.
  ,, in diarrhœa, 108.
  ,, in rickets, 107.
  ,, in scurvy, 108.
  ,, Milk the type of perfect, 84.
Dilution of cow's milk, 85.
Discharge from vulva, 146.
Drainage, 115; Defective, 43, 55.
Drugs excreted, in milk, 80; during dentition, 121, 122.

E

EDUCATION in infant-rearing, 60, 62.
  ,, Postpone commencement of, in young children, 111.
Eggs, 192.
Eight months' children, Superstition concerning, 3.
Employment of women, 41, 59.
England, Sending children home to, from tropics, 127.
Entire wheat flour, 74.
Epiphyses of bones, 16; enlarged in rickets, 49.
Exercise, Indoor, 120; Outdoor, 123.
Expectoration absent in infancy, 146.
Eyes, Inflammation and care of, 131; Puffiness of, 141.

F

FACIAL paralysis, 141.
Factories, Employment of mothers in, 41.
Fæces, 10.
Farinaceous foods, 99, 105.
Fat in new-born, 2.
  ,, rickets, 51.
  ,, starvation, 84.
Fatty element in diet, 84; in milk, 83, 84.
Feeding after weaning, 99.
  ,, before milk comes, 73.
  ,, bottles, 97, 98.
  ,, Insufficient and improper, 44.
  ,, Too frequent, 75.
Feet, Coverings for, 120; Natural shape of, 120; Turning in, 148.
Fingers clubbed, 8, 142.
Flour ball, 99.
Fontanelles, 16, 140.
Foramen ovale, Closure of, 8.
Forced feeding in premature, 136.
Frænum linguæ, 12.
Fresh air, Effect of deficiency of, 43; Importance in infant-rearing, 111.

G

GALTON'S *Life History Album*, 24.
Gas in nursery, 114.
Gastro-enteric catarrh, 47.
Gavage (forced feeding), 136.
Germs in milk, 46.
Glands, Enlarged, 142.
Goat keeping, 71, 72.
Goat's milk, 71.
Gouttes de Lait, 68.
Green motions, 146.
Grip in infants, 20.
Growing pains, 145.
Growth in weight and stature, 27.
Gum lancet, Use and abuse of, 122.

H

Hair at birth, 6; Care of, 117.
Head girth and chest girth, 140; moulded in labour, 4; in rickets, 49; Sweating from, 50, 141; Swelling of, 142; Unusual size of, 140.
Health leaflets, 61, 150-155.
Health visitors, 61, 62; Notes for, 148.
Hearing, Acquirement of, 21.
Heat, Loss of, from skin, 10, 133.
Hernia, Inguinal, 143; Umbilical, 131.
"Holding out," 117.
Holt, Emmett, formulæ for artificial feeding, 90; instructions for sterilising, 71.
Household milk supply, 66.
Huddersfield experiment, 61, 157.
Humanised milk, 84.
Humanising by precipitation, 92.
Human milk, see *Milk*.
Hygiene of infancy, 111; in years following infancy, 123.
Hygienic leaflets, 61, 150-155.

I

Inability to walk, 143.
India, English children in, 124, 127.
Indian corn, 101.
Infantile diarrhœa, 37, 47, 108.
Infant life insurance, 64.
,, Life Protection Act, 65.
Infant mortality, Causes of, 35-36, 39; in India, 125; in urban and rural compared, 34-37; in various countries, 38; Undiminished rate of, 33
Infants, deaths of, Mode of Investigation, 148.
Inguinal hernia, 143.
Insanitary dwellings, 43.
Instruction in infant-rearing, 60.
Intellectual faculties, Development of, 23.
Intemperance in women, 40.

J

Jaundice in new-born, 6.
Jenner's three signs of rickets, 51.

L

Lact-albumen, 82.
Lactation, see *Suckling*.
Lactose, 83, 84, 87.
Lady sanitary inspectors, 81.
Lanugo, 2.
Length, Average, 1.
,, Growth in, 31.
Lentil flour, 75.
Leucoma, 132.
Lice, 56, 117.
Light in nursery, 115.
Limbs, Movement of, 20.
Lime juice, 52, 108.
,, water, 86.
Liver, Large, in infancy, 6.

M

Maize, 101.
Malaria, 80, 127.
Males, Proportion of, to females, 3.
Marriage, Improvident, effect on infant mortality, 41.
Mastitis neonatorum, 15.
Measuring food, 85.
Meat, 14, 101.
,, Predigested, 102.
,, Raw, 101.
Meconium, 11.
Menstruation during lactation, 76.
Midwives, Instruction of, 62.
Milk, Digestion of, 13; temperature affects souring, 47.
Milk, human, Amount taken by suckling, 74.
,, Composition of, 82.
,, Drugs excreted in, 80.
,, First secreted, 11.
,, Microscopic appearances, 78.
,, Quality of, 77.
Milk of cow, Causes of impurity, 65.
,, Composition of, compared with human milk, 82.
,, Condensed, 93.
,, Depôts for pure, 67.
,, Dilution of, 85.
,, Diseases spread by, 46.

Milk of cow, Distribution of, in bottles, 66.
,, Feeding of infants with, 83.
,, Household supply, 66.
,, Humanising, by precipitation, 92.
,, Modification—Various methods, 85-91.
,, Myers Coplan's observations, 70.
,, Peptonised, 93.
,, Pure milk supply, 65.
,, Sterilisation, 68.
Milk of goat, 71.
Milk-teeth, 24, 121.
Monsters, 41.
Morbus cæruleus, 8.
Motor functions, 19.
Mouth-breathing, 141.
Mouth, Soreness of, hindering suckling, 76.

N

Navel, Care of, 129; infection, 130.
Navel-string, 4.
Neck, Swelling in, 142.
Nervous system, 18.
New-born child, Average weight, 1; breast, Inflammation of, 15; breasts of, Milk in, 15; Examination of, 5; head of, Shape of, 4; Jaundice in, 6; Signs of maturity of, 1; Signs of recent birth of, 4; Special care of, 128.
Nipples, Sore, 76.
Nitrogenous element in diet, 84.
Notification of birth, 63; of still births, 39, 63.
Nostrils, Dilatation of, 141.
,, Obstruction of, 141.
Nursery, 115.
Nurses, Trained, for infants, 63.
Nursing women, Regimen for, 70.

O

Oatmeal, 26, 100.
Open air in infancy, 111.
Ophthalmia in new-born, 131.
Outdoor exercise, 112.
Overcrowding of urban areas, 43; Standard required for, 64.
Overlying, 42.

P

Paralysis of arm, 142; of face, 141.
Parental ignorance, 42.
Pasteurisation, 68, 96.
Patent foods, Use and abuse of, 94, 99, 102, 105.
Peptonised milk, 93.
Percentage system, 89, 90.
Perspiration in infancy, 15; from head in rickets, 51, 141.
Philanthropic associations and infant rearing, 62.
Phimosis, 145.
Physical Deterioration Report, 33.
Potato, 101.
Pot-belly, 143.
Poverty and infant mortality, 43.
Predigested milk, 93.
Pre-maternity hospitals, 60.
Premature births, 39.
,, infants, Care of, 133.
,, ,, Characters of, 3.
Prickly heat, 126.
Proteids in milk, 82.
Puffiness of eyes and nose, 141.
Pulse, 8.
Punkahs, 125.
Pure milk depôts, 67.
Purulent ophthalmia, 131.

Q

Quantity of breast milk taken, 74; of food in artificial feeding, 87-91; of milk taken by weaklings, 138.

R

Rashes on skin, 144.
Raw meat, 101, 102.
Recent birth, Signs of, 4.
Red-gum, 145.
Registrar-General's Report, 1891, 33-37; 1904, 34-38.

Respiration, Artificial, 129.
,, Establishment of, 6.
,, Rate and characters of, 7.
Respiratory diseases, 54.
Rheumatism, 53.
Rice, 101.
Rickets, 48; Cause of, 51; Diet in, 101; Rosary, 56; Symptoms of, 48-51.
Robinson, Louis, observations on power of grip, 20.
Rupture, Inguinal, 143.
,, Umbilical, 131.

S

Sago, 101.
Saliva, 13.
Sanitary (hygienic) leaflets, 61, 150-155.
,, inspectors, 61, 62, 147.
,, reform, 61.
School attendance should begin late, 112.
Scurvy, 52; Diet in, 108
Scurvy-preventing power in milk, 69.
Sensory functions, 21.
Seven-months children, 3, 133.
Shoes, 120.
Shortening, 119.
Sight, Development of, 21; Loss of, in ophthalmia, 132.
Signs of diseases in first ten days, 157.
,, recent birth, 4.
Skin, Colour of, in new-born, 2; Desquamation from, 6; Rashes, 144.
Skull, 18.
Sleep, 121; Insufficient, 121.
Sleeping out, 111, 112.
Smell, Development of, 21.
Snuffles, 141.
Solid food unsuitable in infancy, 14.
Soothing syrups, 122.
Sour milk, 25.
Soxhlet's steriliser, 95.
Special diseases of infancy, 47.
,, ,, new-born, 157.
,, senses, 21.
Speech, Acquirement of, 22.
Spina bifida, 143.
Spinal weakness, 143.
Squinting, 141.
Starchy food, 13, 99, 105.
Stature, Growth in, 31.
Sterilisation of milk, 68, 71, 95.
Still births, Notification of, 63.
,, Registration of, 39.
Suction, 12.
Suckling, Commencement of, 73; Difficulties of, 75; Disusage of, 45; Frequency of, 74; hindered by sore mouth, 76; How long to continue, 80; in tropics, 125; Menstruation during, 76; Mode of, 75; Regimen during, 79.
Sunshine, 43.
Surroundings of infancy, Faulty, 43, 55.
Sutures of skull, 18.
Sweating from head, 50, 141.
Swelling in groin, 143; in neck, 142; of abdomen, 143; of head in new-born, 142.
Sylvester's method, 128, 129.
Syphilis, Cause of rose rash and sores, 145; Cause of snuffles, 141; Cause of still-births and miscarriages, 39; in wet nurses, 77, 145; Occasional factor in rickets, 51.

T

Tables—
  Weight in infancy, 30.
  Growth in stature, 31.
  Infant mortality, urban and rural, 34.
  Causes of infant mortality in urban and rural district areas, 35, 36.
  Diarrhœal diseases, Mortality from, 37.
  Causes why infants fail to thrive, 55-57.
  Comparative composition of human, cow, and goat milk, 72.
  Amount of milk taken at breast, 54.
  Comparative composition of human and cow milk, 82
  Feeding-schedule, second method, 89.
  ,, third method, 90.

CHARLES GRIFFIN & CO.'S MEDICAL SERIES.

Standard Works of Reference for Practitioners and Students.

Issued in Library Style, large 8vo, Handsome Cloth, fully Illustrated.

A TEXT-BOOK OF HUMAN ANATOMY

(SYSTEMATIC AND TOPOGRAPHICAL),

Including the Embryology, Histology, and Morphology of Man, with Special Reference to the Requirements of Practical Surgery and Medicine.

By ALEXANDER MACALISTER, M.A., M.D., LL.D., D.Sc., F.R.S.,
Professor of Anatomy in the University of Cambridge, and Fellow of St. John's College.

In Large 8vo, with 816 Illustrations. 36s.

"By far the most important work on this subject which has appeared in recent years. —*The Lancet.*

"Destined to be a main factor in the advancement of Scientific Anatomy. . . The fine collection of Illustrations must be mentioned."—*Dublin Medical Journal.*

"This Splendid Work."—*Saturday Review.*

APPLIED ANATOMY.

By E. H. TAYLOR, M.D. (See page 95).

Handsome Cloth. With Nearly 400 Illustrations. Large 8vo. 30s. net.

A TEXT-BOOK OF HUMAN PHYSIOLOGY.

Including Histology and Microscopical Anatomy, with Special Reference to the Requirements of Practical Medicine.

By Dr. L. LANDOIS,
Professor of Physiology and Director of the Physiological Institute in the University of Griefswald.

Translated from the last German Edition and Edited by A. P. Brubaker, M.D., Professor of Physiology at Jefferson Medical College, Philadelphia, &c., and Augustus A. Eshner, M.D., Professor of Clinical Medicine, Philadelphia Polyclinic.

"The work now represents all that is best in this vast and far-reaching science. A a work of reference, and as an aid to daily practice, we unhesitatingly recommend this encyclopædic treatise."—*Medical Times.*

An Introduction to EMBRYOLOGY.

By ALFRED C. HADDON, M.A., M.R.I.A.,
Professor of Zoology in the Royal College of Science, Dublin. 18s.

"An excellent resumé of recent research, well adapted for self-study."—*The Lancet.*

Griffin's Medical Series—*Continued.*

CLINICAL DIAGNOSIS.

The Chemical, Microscopical, and Bacteriological Evidence of Disease.

By Prof. von JAKSCH, of Prague.

FIFTH ENGLISH EDITION, 24s. net,

Based upon the Fifth German Edition, but containing additional matter and illustrations.

EDITED BY

ARCHIBALD E. GARROD, M.A., M.D., F.R.C.P.

"A Standard Text-Book, fair in statement, accurate in detail, and comprehensive in cope. . . . We know of none better."—*British Medical Journal.*

CLINICAL MEDICINE.

A PRACTICAL HANDBOOK for PRACTITIONERS & STUDENTS.

By JUDSON BURY, M.D., F.R.C.P.,

Physician to the Manchester Royal Infirmary.

SECOND EDITION, Revised and Enlarged.

With Numerous Illustrations, Several in Colours. 21s.

With Additional Chapters on Skin Diseases, Laryngoscopic Examinations, and on Röntgen Rays in Surgery.

"An accurate and up-to-date representation of Clinical Medicine, which must prove of the utmost use, and ONE THAT IS NOT SURPASSED IN THE ENGLISH LANGUAGE."—*British Medical Journal.*

"WE CAN CORDIALLY RECOMMEND THIS VOLUME to our readers, and congratulate the author on the success of his labours."—*The Lancet.*

"The Book is one of the best of its kind. . . . We see EVERY SIGN OF VITALITY ABOUT IT."—*Edinburgh Medical Journal.*

Important New Work. In Two Volumes. Large 8vo. 36s. net.

In Large 8vo. Handsome Cloth. With numerous Diagrams and Illustrations.

DISEASES OF THE ORGANS OF RESPIRATION.

An Epitome of the Etiology, Pathology, Symptoms, Diagnosis, and Treatment of Diseases of the Lungs and Air Passages.

By SAMUEL WEST, M.A., M.D., F.R.C.P.,

Physician and Demonstrator of Practical Medicine, St. Bartholomew's Hospital;
Member of the Board of Faculty of Medicine in the University of Oxford;
Senior Physician to the Royal Free Hospital; Consulting Physician
to the New Hospital for Women, &c., &c.

"We can speak in the highest terms of praise of the whole work."—*The Lancet.*

"We have much pleasure in expressing our high admiration of Dr. West's work.'—*Medical Chronicle.*

GRIFFIN'S MEDICAL SERIES—*Continued.*

PERNICIOUS ANÆMIA.

ITS PATHOLOGY, INFECTIVE NATURE, SYMPTOMS, DIAGNOSIS AND TREATMENT.

Including investigations on

THE PHYSIOLOGY OF HÆMOLYSIS.

BY WILLIAM HUNTER, M.D., F.R.C.P., F.R.S.E.,

Physician to the London Fever Hospital; Assistant-Physician, Charing Cross Hospital; Examiner in Medicine, Glasgow University, &c., &c.

With Plates (4 coloured), Illustrations, and 2 Folding Diagrams. 24s. net.

CONTENTS.—Part I. Historical.—Part II. Morbid Anatomy.—Part III. Experimental.—Part IV. The Infective Nature of Pernicious Anæmia.—Part V. Etiology.—Part VI. Symptoms.—Part VII. Treatment.—Part VIII. The Physiology of Blood Destruction.—Part IX. Hæmolysis and Jaundice.—INDEX.

"We can speak in the highest terms as to Dr. Hunter s investigations on Hæmolysis, which are some of the most ELABORATE and INSTRUCTIVE yet carried out. . . . He has added greatly to what was previously known as to the nature of the disease."—*The Lancet.*

With Tables, and Eight Plates in Colours. Price One Guinea, Net.

FIBROID DISEASES OF THE LUNG, including FIBROID PHTHISIS.

BY

SIR ANDREW CLARK, BART., M.D., LL.D., F.R.S.,

Late President to the Royal College of Physicians, London; Consulting Physician to the London Hospital, and to the City of London Hospital for Diseases of the Chest,

AND

W. J. HADLEY, M.D., AND ARNOLD CHAPLIN, M.D.,

Assistant Physicians to the City of London Hospital for Diseases of the Chest.

"It was due to Sir ANDREW CLARK that a PERMANENT RECORD of his MOST IMPORTANT piece of PATHOLOGICAL AND CLINICAL WORK should be published. . . . A volume which will be HIGHLY VALUED BY EVERY CLINICAL PHYSICIAN."—*British Medical Journal.*

DISEASES OF THE EYE.

BY DR. ED. MEYER, OF PARIS.

From the Third French Edition,

BY A. FREELAND FERGUS, M.D.,

Surg., Eye Infirmary, Glasgow; Ophthalmic Surgeon, Glasgow Royal Infirmary.

With Coloured Plates. 25s.

"An EXCELLENT TRANSLATION of a Standard French Text-Book. . . . Essentially a PRACTICAL WORK. The publishers have done their part in the tasteful and substantial manner characteristic of their medical publications."—*Ophthalmic Review.*

GRIFFIN'S MEDICAL SERIES—*Continued.*

THE DIAGNOSIS OF

DISEASES OF THE HEART.

BY A. ERNEST SANSOM, M.D., F.R.C.P.,

Physician to, and Lecturer on Clinical Medicine at, the London Hospital; Consulting Physician,
North-Eastern Hospital for Children; Examiner in Medicine, Royal College of
Physicians, Royal College of Surgeons, &c., &c. 28s.

"Dr. Sansom has opened to us a TREASURE-HOUSE OF KNOWLEDGE. . . . The originality of the work is shown on every page, an originality so complete as to mark it out from every other on the subject with which we are acquainted."—*Practitioner.*

"A book which does credit to British Scientific Medicine. We warmly commend it to all engaged in clinical work."—*The Lancet.*

DISEASES OF THE SKIN.

BY SIR T. M'CALL ANDERSON, M.D.,

Professor of Systematic Medicine in the University of Glasgow; Examiner in Medicine
and Pathology, H.M. British and Indian Army Medical Service.

SECOND EDITION. Revised and Enlarged. With four Coloured Plates. 25s.

"Beyond doubt, the MOST IMPORTANT WORK on Skin Diseases that has appeared in England for many years."—*British Medical Journal.*

THE DISEASES OF CHILDHOOD

(MEDICAL).

BY H. BRYAN DONKIN, M.A., M.D.OXON., F.R.C.P.;

Physician to the Westminster Hospital and to the East London Hospital for Children at
Shadwell; Lecturer on Medicine and Clinical Medicine at Westminster
Hospital Medical School; Examiner in Medicine to the
Royal College of Physicians. 16s.

"In every sense of the word a FRESH and ORIGINAL work, recording the results of the author's OWN LARGE EXPERIENCE."—*The Lancet.*

A Treatise on GOUT.

BY SIR DYCE DUCKWORTH, M.D., LL.D., F.R.C.P.,

Physician to, and Lecturer on Clinical Medicine at, St. Bartholomew's Hospital. 25s.

With a Coloured Plate.

"At once thoroughly practical and highly philosophical. The practitioner will find in it an ENORMOUS AMOUNT OF INFORMATION."—*Practitioner.*

GRIFFIN'S MEDICAL SERIES—*Continued.*

THE STRUCTURE AND FUNCTIONS OF
THE BRAIN AND SPINAL CORD.

By Sir VICTOR HORSLEY, F.R.S.,

Surgeon to University College Hospital, and to the National Hospital for Paralysed and Epileptic, &c., &c. 10s. 6d.

"We HEARTILY COMMEND the book to all readers and to ALL CLASSES OF STUDENTS ALIKE, as being almost the only lucid account extant, embodying the LATEST RESEARCHES and their conclusions."—*British Medical Journal.*

THE ANATOMY OF
THE CENTRAL NERVOUS ORGANS
IN HEALTH AND DISEASE.

By Professor OBERSTEINER, of Vienna.

Translated by ALEX HILL, M.A., M.D.,

Master of Downing College, Cambridge.

SECOND ENGLISH EDITION, Revised, Enlarged, and almost entirely Re-written. With additional Illustrations. Price 30s.

"Dr. Hill has enriched the work with many Notes of his own. . . . Dr. Obersteiner's work is admirable. . . . INVALUABLE AS A TEXT-BOOK."—*British Medical Journal.*

ON PERIPHERAL NEURITIS.

By JAS. ROSS, M.D., LL.D.,

Late Physician to the Manchester Royal Infirmary, and Joint Professor of Medicine at the Owens College; and

JUDSON BURY, M.D., F.R.C.P.,

Senior Assistan Physician to the Manchester Royal Infirmary.

With Illustrations, Large 8vo, Handsome Cloth, 21s.

"It will for many years remain the AUTHORITATIVE TEXT-BOOK on peripheral neuritis."—*British Medical Journal.*

"A monument of industry."—*Edinburgh Medical Journal.*

GRIFFIN'S MEDICAL SERIES—*Continued.*

MENTAL DISEASES:

With Special Reference to the Pathological Aspects of Insanity.

By W. BEVAN LEWIS, L.R.C.P., M.R.C.S.,

Medical Superintendent and Director of the West Riding Asylum, Wakefield; Examiner in Mental Diseases, Victoria University.

SECOND EDITION, Revised and in part Rewritten. With Additional Illustrations. 30s.

"Without doubt the BEST WORK in English of its kind."—*Journal of Mental Science.*

"This ADMIRABLE TEXT-BOOK places the study of Mental Diseases on a SOLID BASIS. . . The plates are numerous and admirable. To the student the work is INDISPENSABLE."—*Practitioner.*

LUNATIC ASYLUMS: Their Organisation and Management.

By CHARLES MERCIER, M.B., F.R.C.S.,

Lecture on Neurology and Insanity, Westminster Hospital Medical School, &c., &c. 16s.

(*For details see page* 106).

"WELL WORTHY of thoughtful study. . . . Contains an immense amount of useful and interesting information."—*Medical Press.*

"Will give a NEEDED IMPETUS to the study of Asylum Patients."—*Glasgow Med. Journal.*

FORENSIC MEDICINE AND TOXICOLOGY.

By J. DIXON MANN, M.D., F.R.C.P.,

Physician to the Salford Royal Infirmary; Professor of Medical Jurisprudence and Toxicology, Owens College, Manchester; Examiner in Forensic Medicine, London University, and Victoria University, Manchester.

FOURTH EDITION, Thoroughly Revised and Enlarged. 21s.

"We consider this work to be one of the BEST TEXT-BOOKS ON FORENSIC MEDICINE AND TOXICOLOGY NOW IN PRINT, and we cordially recommend it to students who are preparing for their examinations, and also to practitioners who may be, in the course of their professional work, called upon at any time to assist in the investigations of a medico-legal case."—*The Lancet* (on the New Edition).

POISONS: THEIR EFFECTS AND DETECTION.

By A. WYNTER BLYTH, M.R.C.S., F.C.S.,

Barrister-at-Law, Public Analyst for Devonshire, and Med. Officer of Health for St. Marylebone.

FOURTH EDITION, Revised and Enlarged. (See p. 112.)

GRIFFIN'S MEDICAL SERIES—*Continued.*

In Large 8vo, Handsome Cloth, with Illustrations and 24 Plates. 25s.

A TREATISE ON RUPTURES.

By JONATHAN F. C. H. MACREADY, F.R.C.S.,

Surgeon to the Great Northern Central Hospital; to the City of London Hospital for Diseases of the Chest, Victoria Park; to the City of London Truss Society, &c., &c.

"Certainly by far the most COMPLETE and AUTHORITATIVE WORK on the subject."—*Edin. Med. Journal.*

"Much THE MOST IMPORTANT work on Hernia which has appeared of late years. The Plates are of an order of ARTISTIC MERIT and SCIENTIFIC ACCURACY not often met with."—*Glasgow Medical Journal.*

THE SURGERY OF THE KIDNEYS.

Being the Harveian Lectures for 1889.

By J. KNOWSLEY THORNTON, M.B., C.M.,

Cons. Surgeon to the Samaritan Free Hospital; to the Grosvenor Hospital for Women; to the New Hospital for Women and Children, &c., &c.

In Demy 8vo, with Illustrations, Cloth, 5s.

"The name and experience of the Author confer on the Lectures the stamp of authority." —*British Medical Journal.*

The SURGERY of the SPINAL CORD.

BY WILLIAM THORBURN, B.S., B.SC., M.D., F.R.C.S.,

Honorary Surgeon to the Manchester Royal Infirmary; Assistant-Lecturer on Surgery, Owens College, Manchester. 12s. 6d.

"Really the FULLEST RECORD we have of Spinal Surgery, and marks an important advance. —*British Medical Journal.*

RAILWAY INJURIES:

With Special Reference to those of the Back and Nervous System, in their Medico-Legal and Clinical Aspects.

BY HERBERT W. PAGE, M.A., M.C. CANTAB., F.R.C.S. ENG.,

Surgeon to St. Mary's Hospital; Lecturer on Surgery, St. Mary's Hospital Medical School; Consulting Surgeon L. & N.-W. Rwy. Co., &c., &c. 6s.

"A work INVALUABLE to those who have many railway cases under their care pending litigation. . . . A book which every lawyer as well as doctor should have on his shelves." —*British Medical Journal.*

GRIFFIN'S MEDICAL SERIES—*Continued.*

Beautifully Illustrated, with 176 Figures and Plates, many in Colours.
30s. net.

APPLIED ANATOMY:

A Treatise for Students, House Surgeons, and for Operating Surgeons.

BY EDWARD H. TAYLOR, M.D. (Dublin), F.R.C.S., I.,

Surgeon to Sir Patrick Dun's Hospital; Examiner and late Lecturer in Applied Anatomy, Trinity College, Dublin; Examiner in Surgery, Royal College of Surgeons in Ireland.

CONTENTS.—**The Anatomy of the Head and Neck:** The Scalp, the Skull, the Membranes of the Brain, the Brain, the Ear, Face, Eye, Nose, Mouth, &c.—**The Upper Extremity:** Axilla, Arm, Elbow, Forearm, Wrist, and Hand.—**The Thorax:** Neck and Chest.—**Abdomen.—Inguinal Region.—Organs of Reproduction.—The Lower Extremity:** Gluteal Region, Thigh, Knee, Leg, Ankle, Foot.—**Index.**

"The ILLUSTRATIONS are a distinct feature of the book; they are both NUMEROUS and EXCELLENT, and they admirably serve their purpose of MAKING STILL MORE CLEAR THE ALREADY LUCID TEXT. In our opinion the book is ONE OF THE BEST OF ITS KIND, and we can cordially recommend it for ACCURACY, CLEARNESS, and the interesting manner in which it is written."—*British Medical Journal.*

Sole Authorised English Edition.

SECOND EDITION, Revised, Greatly Enlarged, and Re-Written.

THE WORK OF THE DIGESTIVE GLANDS.

BY PROFESSOR PAVLOV, OF ST. PETERSBURG.

TRANSLATED INTO ENGLISH BY

W. H. THOMPSON, M.D., M.Ch., F.R.C.S.,

King's Professor of Institutes of Medicine, Trinity College, Dublin; Examiner in Physiology R.C.S. Eng. and Royal University, Ireland.

"Full of new and interesting facts that should be read and reflected upon by all who practice medicine."—*The Lancet.*

SECOND EDITION. In Large 8vo. Cloth. Greatly Enlarged, Re-set on larger page with margin index. 7s. 6d. net.

MEDICAL ETHICS.

BY ROBERT SAUNDBY, M.D., M.SC., LL.D., F.R.C.P.,
Professor of Medicine in the University of Birmingham, &c.

"Will be a valuable source of information for all who are uncertain as to what custom prescribes and what it prohibits."—*British Medical Journal.*

MAMMALIAN DESCENT: Man's Place in Nature. Being the Hunterian Lectures for 1884. Adapted for General Readers. By Prof. W. KITCHEN PARKER, F.R.S., Hunterian Professor, Royal College of Surgeons. With Illustrations. In 8vo, Cloth. 10s. 6d.

Imperial 8vo. Handsome Cloth. Beautifully Illustrated. With Thirty-six Coloured Plates, comprising 167 Figures. 18s.

ATLAS OF
URINARY SEDIMENTS:
With Special Reference to their Clinical Significance.

Edited and Annotated by SHERIDAN DELÉPINE, M.B., C.M.Edin., Professor of Pathology in Owens College and Victoria University, Manchester. Translated by FREDERICK C. MOORE, M.Sc., M.B.Vict., from the German of Dr. HERMANN RIEDER, of the University of Munich.

"The work gains much in value from the editorial notes of Prof. Delépine, which are, for the most part, EMINENTLY PRACTICAL."—*Edinburgh Medical Journal.*

"May be pronounced A SUCCESS IN EVERY WAY. . . . The plates are most BEAUTIFULLY EXECUTED AND REPRODUCED. . . . The drawings are excellent, and by FAR THE BEST WE HAVE SEEN. The additious to the text are considerable and valuable."—*The Lancet.*

With Illustrations. Handsome Cloth. 8s. 6d. net.

THE PHYSIOLOGY AND PATHOLOGY
OF THE
URINE.

By J. DIXON MANN, M.D., F.R.C.P.,
Physician to the Salford Royal Infirmary.

GENERAL CONTENTS.—General Characteristics.—Organic Constituents.—Carbohydrates.—Proteids.—Nitrogenous Substances.—Pigments and Chromogens.—Special Characteristics.—Urinary Sediments.—Pathology.

"DR. DIXON MANN is to be congratulated on having produced a work which cannot fail to be of inestimable value alike to medical men and students, and which is in every respect worthy of his high reputation."—*Brit. Med. Journ.*

Published Quarterly, Price 6s. Annual Subscription, 20s.; Post Free, 21s. Subscriptions payable in advance.

THE JOURNAL OF ANATOMY AND PHYSIOLOGY:
NORMAL AND PATHOLOGICAL.
HUMAN AND COMPARATIVE.

CONDUCTED BY

SIR WM. TURNER, K.C.B., M.B., LL.D., D.C.L., F.R.S.,
Principal of the University of Edinburgh;

D. J. CUNNINGHAM, M.D., D.Sc., LL.D., D.C.L., F.R.S.,
Prof. of Anatomy in the University of Edinburgh;

G. S. HUNTINGDON, A.M., M.D.,
Professor of Anatomy in the Columbia University, New York;

A. MACALISTER, M.D., LL.D., D.Sc., F.R.S., F.S.A.,
Prof. of Anatomy in the University of Cambridge;

AND J. G. M'KENDRICK, M.D., LL.D., F.R.S.,
Prof. of Physiology in the University of Glasgow.

⁂ MESSRS. GRIFFIN will be glad to receive at their Office Names of SUBSCRIBERS to the Journal.

GRIFFIN'S "POCKET" MEDICAL SERIES OF REFERENCE BOOKS.

Elegantly Bound in Leather, with Rounded Edges, for the Pocket.

		PAGE
A Surgical Handbook,	MM. Caird and Cathcart,	98
A Medical Handbook,	R. S. Aitchison, M.D.,	98
A Handbook of Hygiene,	Lt.-Colonel Davies, D.P.H.,	99
The Surgeon's Pocket-Book,	MM. Porter and Godwin,	99
The Diseases of Children,	MM. Elder and Fowler,	99
A Handbook of Medical Jurisprudence,	W. A. Brend, M.A., M.B., B.Sc.,	100
Outlines of Bacteriology,	Thoinot, Masselin, and Prof. Symmers,	100
Tropical Medicine and Parasitology,	Gilbert Brooke, M.A., L.R.C.P., D.P.H.,	100

⁂ Other Volumes in Active Preparation.

⁂ The aim of the "Pocket" Series is to afford to the reader all that is **essential** in the **most handy** and **portable form.** Every aid to ready Reference is afforded by Arrangement and Typography, so that the volumes can be carried about and consulted with ease by the Practitioner at any moment.

OPINION OF "THE LANCET" ON ONE OF THE "POCKET" SERIES.

"Such a work as this is really **necessary** for the busy practitioner. The field of medicine is so wide that even the best informed may at the moment miss the salient points in diagnosis . . . he needs to refresh and revise his knowledge, and to focus his mind on those things which are **essential.** . . . **Honestly Executed.** . . . No mere compilation, the scientific spirit and standard maintained throughout put it on a higher plane. . . . **Excellently** got up, handy and portable, and well adapted for **ready reference.**" —*The Lancet.*

Griffin's "Pocket-Book" Series.

Fourth Edition, Revised and Enlarged. Pocket-Size, Leather, 8s. 6d.

A MEDICAL HANDBOOK,

For the Use of Practitioners and Students.

By R. S. AITCHISON, M.D.Edin., F.R.C.P.

With Numerous Illustrations.

General Contents.—Case-taking—Diseases of the Circulatory System—of the Respiratory System—of the Renal System—of the Digestive System—of the Nervous System—of the Hæmopoietic System—Fevers and Miasmatic Diseases—Constitutional Diseases—General Information and Tables Useful to the Practitioner—Rules for Prescribing—Prescriptions—Appendix.

"Such a work as this is really necessary for the busy practitioner. The field of medicine is so wide that even the best informed may at the moment miss the salient points in diagnosis . . . he needs to refresh and revise his knowledge, and to focus his mind on those things which are essential. We can speak highly of Dr. Aitchison's Handbook. . . . Honestly Executed. . . . No mere compilation, the scientific spirit and standard maintained throughout put it on a higher plane. . . . Excellently got up, handy and portable, and well adapted for ready reference."—*The Lancet.*

"We strongly recommend this little work as a reliable guide for medical practice. Elegantly got up."—*Liverpool Medico-Chirurgical Review.*

"As a means of ready reference, most complete. The busy practitioner will often turn to its pages."—*Journ. of the American Med. Association.*

Fourteenth Edition, *Thoroughly Revised. Pocket-Size, Leather,* 8s. 6*d. With very Numerous Illustrations.*

A SURGICAL HANDBOOK,

For Practitioners, Students, House-Surgeons, and Dressers.

BY

F. M. CAIRD,
M.B., F.R.C.S. Ed.,
Surgeon,
Royal Infirmary, Edinburgh.

AND

C. W. CATHCART,
M.B., F.R.C.S. Eng. & Ed.,
Surgeon,
Royal Infirmary, Edinburgh.

⁂ The New Edition has been thoroughly Revised and partly Re-written. Much New Matter and many Illustrations of New Surgical Appliances have been introduced.

GENERAL CONTENTS.—Case-Taking—Treatment of Patients before and after Operation—Anæsthetics: General and Local—Antiseptics and Wound-Treatment—Arrest of Hæmorrhage—Shock and Wound Fever—Emergency Cases—Tracheotomy: Minor Surgical Operations—Bandaging—Fractures—Dislocations, Sprains, and Bruises—Extemporary Appliances and Civil Ambulance Work—Massage—Surgical Applications of Electricity—Joint-Fixation and Fixed Apparatus—The Syphon and its Uses—Trusses and Artificial Limbs—Plaster-Casting—Post-Mortem Examination—Sickroom Cookery, &c.

"Thoroughly practical and trustworthy. Clear, accurate, succinct."—*The Lancet.*

"Admirably arranged. The best practical little work we have seen. The matter is as good as the manner."—*Edinburgh Medical Journal.*

"This excellent little work. Clear, concise, and very readable. Gives attention to important details, often omitted, but absolutely necessary to success."—*Athenæum.*

"A dainty volume."—*Manchester Medical Chronicle.*

Griffin's "Pocket-Book" Series.

THIRD EDITION, with Important Supplement. Pocket-Size. Leather.
With Illustrations. 8s. 6d. net.

A HANDBOOK OF HYGIENE.

BY

LT.-COLONEL A. M. DAVIES, D.P.H.Camb.,

Late Assistant-Professor of Hygiene, Army Medical School.

General Contents.

Air and Ventilation—Water and Water Supply—Food and Dieting—Removal and Disposal of Sewage—Habitations—Personal Hygiene—Soils and Sites—Climate and Meteorology—Causation and Prevention of Disease—Disinfection—INDEX.

"WE KNOW OF NO BETTER WORK; the subject matter is good, . . . the portability and general get-up of the volume are likely to be appreciated."—*The Lancet.*

FOURTH EDITION, *Revised and enlarged. Leather, with* 152 *Illustrations and Folding-plate.* 8*s.* 6*d.*

THE SURGEON'S POCKET-BOOK.

Specially adapted to the Public Medical Services

BY MAJOR J. H. PORTER.

Revised and in great part rewritten

BY BRIGADE-SURGEON C. H. Y. GODWIN,

Late Professor of Military Surgery in the Army Medical School.

"AN INVALUABLE GUIDE to all engaged, or likely to be engaged, in Field Medical Service."—*Lancet.*

"A complete *vade mecum* to guide the military surgeon in the field."—*British Medical Journal.*

Pocket-Size. Leather. With Illustrations. 10*s.* 6*d.*

THE DISEASES OF CHILDREN:

A CLINICAL HANDBOOK.

BY

GEO. ELDER, M.D., F.R.C.P.ED., AND J. S. FOWLER, M.B., F.R.C.P.ED.,

Clinical Tutors, Royal Infirmary, Edinburgh; Physicians for Out-patients, Leith Hospital.

"MUCH MORE is contained in it, than in many similar books professing more.—*Bristol Medical Journal.*

LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.

Griffin's "Pocket-Book" Series.

Pocket-Size. Leather. With Frontispiece. 8*s.* 6*d.*

A HANDBOOK OF
Medical Jurisprudence and Toxicology,
FOR THE USE OF STUDENTS AND PRACTITIONERS.

BY WILLIAM A. BREND, M.A.CANTAB, M.B., B.SC.LOND.,
Late Scholar of Sidney Sussex College, Cambridge, of the Inner Temple, Barrister-at-Law.

CONTENTS.—PART I. MEDICAL JURISPRUDENCE. Introduction.—Identification of the Living.—Identification and Examination of the Dead.—The Medico-Legal Relations of Death.—Signs of Death.—Death from Causes usually leading to Asphyxia.—Death by Burning, Sunstroke, and Electricity.—Death from Cold and Death from Starvation.—Wounds and Mechanical Injuries.—Matters Involving the Sexual Functions.—Pregnancy and Legitimacy.—Criminal Abortion.—Birth.—Infanticide.—Forms of Insanity.—Legal Relationship of Insanity and other Abnormal States of Mind.—Medical Examinations for Miscellaneous Purposes.—The Obligations Statutory and Moral. of the Medical Man.—Evidence and Procedure as regards the Medical Man. PART II.—TOXICOLOGY. General Facts with regard to Poisons.—Corrosive Poisons.—Irritant Poisons (Metals and Non-Metals).—Gaseous Poisons.—Poisonous Carbon Compounds.—Poisons of Vegetable Origin.—Poisons of Animal Origin.—Appendix.—INDEX.

"We recommend it as a trustworthy work . . . one especially suitable for students and practitioners of medicine . . . the necessary facts only are stated."—*Lancet.*

Pocket-Size. Leather. With Illustrations, Many in Colours. 10*s.* 6*d.*

OUTLINES OF BACTERIOLOGY:
A Practical Handbook for Students.

ON THE BASIS OF THE

PRÉCIS DE MICROBIE

(OUVRAGE COURONNÉ PAR LA FACULTÉ DE MÉDECINE DE PARIS).

BY DR. L. H. THOINOT AND E. J. MASSELIN.

Translated and adapted for English Use, with Additions,

BY WM. ST. CLAIR SYMMERS, M.B.ABERD.,

"The information conveyed is SINGULARLY FULL AND COMPLETE. We recommend the book for its ACCURACY, CLEARNESS, NOVELTY, AND CONVENIENT SIZE."—*The Lancet.*

Bound in Leather, and Beautifully Illustrated, with Maps in Colours.

TROPICAL MEDICINE, HYGIENE AND PARASITOLOGY.
A Concise and Practical Handbook for Practitioners and Students.

BY GILBERT E. BROOKE, M.A., L.R.C.P., D.P.H.,
Port Health Officer, Singapore, Straits Settlements.

CONTENTS.—Introductory.—Climatology.—Food, Exercise, and Clothing.—Hygiene of the Mouth.—Pregnancy and Infant Feeding in the Tropics.—Classification of Animal Parasites.—Vegetable Parasites.—Cestodes, Trematodes and Nematodes.—Mosquitos.—Fleas and Ticks.—Snake and Other Venomous Bites.—Ankylostomiasis.—Beriberi.—Bilharyiosis.—Blackwater Fever.—Cholera.—Diathermasia and Phoebism.—Distomiasis.—Filariasis.—Granuloma Endemica.—Granuloma Venerea.—Hepatitis and Liver Abscess.—Kala-agar.—Leprosy.—Malaria.—Malta Fever.—Plague.—Skin Diseases of the Tropics.—Small-pox.—Spirillar.—Fever.—Spore.—Trypanosomiasis.—Yaws.—Yellow Fever.—Microscopy.—Photography.—Disinfection.—The Blood.—Intermatoid Sanitary Connections.—Vegetable Poisons in the Tropics.—Collection of Blood-sucking Flies, Ticks, &c.—APPENDICES.—INDEX.

LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.

STUDENTS' STANDARD TEXT-BOOKS.

Fully Illustrated.

		PAGE
Practical Physiology, . .	PROF. STIRLING, M.D., .	102
Practical Histology, . .	,, ,,	102
Physiologist's Note-book, .	ALEX HILL, M.D., . .	103
Biology (Vegetable), . .	PROF. AINSWORTH DAVIS,	104
Biology (Animal), . .	,, ,,	104
Botany: the Flowering Plant,	,, ,,	114
Bird-Life, ...	CHARLES DIXON, . .	115
Zoological Pocket-book, .	PROFS. SELENKA & DAVIS,	103
Practical Pharmacy, . .	WM. ELBORNE, F.L.S., F.C.S., . . .	106
Physics, ...	PROFS. POYNTING AND THOMSON, . . .	113
Midwifery, ...	ARCH. DONALD, M.D., .	105
Diseases of Women, . .	JOHN PHILLIPS, M.D., .	105
Wife and Mother, . . .	A. WESTLAND, M.D., .	108
Infant Rearing, . . .	J. B. HELLIER, M.D., .	108
Lunatic Asylums, . . .	CHARLES MERCIER, M.B.,	106
Nursing, Medical and Surgical, ...	L. HUMPHRY, M.D., .	107
Treatment of Diseases of the Digestive System, . .	R. SAUNDBY, M.D., M.SC., LL.D., F.R.C.P., . .	107
Foods and Dietaries for the Sick, ...	R. BURNET, M.D., . .	107
Ambulance, ...	J. SCOTT RIDDELL, C.M., .	109
First Aid at Sea, . .	JOHNSON SMITH, M.D., .	109
Practical Sanitation, . .	GEO. REID, M.D., D.P.H.,	110
Investigation of Mine Air, .	FOSTER AND HALDANE, .	111
Hygiene Calculations, . .	H. W. G. MACLEOD, M.D.,	110
Hygienic Prevention of Consumption, . . .	J. E. SQUIRE, M.D., D.P H.,	111

LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.

WORKS

By WILLIAM STIRLING, M.D., Sc.D.,

Professor in the Victoria University, Brackenbury Professor of Physiology and Histology in the Owens College, Manchester; and formerly Examiner for the Fellowship of the Royal College of Surgeons, England.

Fourth Edition, *Thoroughly Revised and largely Re-written. In Extra Crown 8vo, with* 620 *pp. and over* 460 *Illustrations.* 15*s. net.*

OUTLINES OF PRACTICAL PHYSIOLOGY:

Being a Manual for the Physiological Laboratory, including Chemical and Experimental Physiology, with Reference to Practical Medicine.

PART I.—CHEMICAL PHYSIOLOGY.

PART II.—EXPERIMENTAL PHYSIOLOGY.

"Professor Stirling has produced THE BEST TEXT-BOOK ON PRACTICAL PHYSIOLOGY WHICH HAS APPEARED SINCE the publication of Sir J. Burdon Sanderson's and his collaborator's well-known 'Handbook to the Physiological Laboratory,' published in 1875. The text is full and accurate and the illustrations are numerous and well executed. . . . We do not think that the reader will ANYWHERE find so REMARKABLE and INTERESTING a collection of experiments on the eye, ear, and skin as are here given. . . . The work will prove a useful reminder even to lecturers."—*The Lancet* (on the New Edition).

Third Edition. *In Extra Crown 8vo, with* 368 *Illustrations, Cloth.* 12*s.* 6*d. In Preparation.*

OUTLINES OF PRACTICAL HISTOLOGY:

A Manual for Students.

*** Dr. Stirling's "Outlines of Practical Histology" is a compact Handbook for students, providing a Complete Laboratory Course, in which almost every exercise is accompanied by a drawing. Very many of the illustrations have been prepared expressly for the work.

"The volume proceeds from a MASTER in his craft. . . . We can confidently recommend this small but CONCISELY-WRITTEN and ADMIRABLY ILLUSTRATED work to students. They will find it to be a VERY USEFUL and RELIABLE GUIDE in the laboratory, or in their own room. All the principal METHODS of preparing tissues for section are given, with such precise directions that little or no difficulty can be felt in following them in their most minute details."—*Lancet.*

"The general plan of the work is ADMIRABLE. . . . It is very evident that the suggestions given are the outcome of a PROLONGED EXPERIENCE in teaching Practical Histology, combined with a REMARKABLE JUDGMENT in the selection of METHODS. . . . Merits the highest praise for the ILLUSTRATIONS, which are at once clear and faithful."—*British Medical Journal.*

In Large 8vo. With 36 Plates and Blank Pages for MS. Notes. Cloth, 12s. 6d.

THE PHYSIOLOGIST'S NOTE-BOOK:

A Summary of the Present State of Physiological Science for Students.

BY ALEX HILL, M.A., M.D.,

Master of Downing College and formerly Vice-Chancellor of the University of Cambridge.

GENERAL CONTENTS :—The Blood—Vascular System—Nerves—Muscle—Digestion—Skin—Kidneys—Respiration—The Senses—Voice and Speech—Central Nervous System—Reproduction—Chemistry of the Body.

CHIEF FEATURES OF DR. HILL'S NOTE-BOOK.

1. It helps the Student to CODIFY HIS KNOWLEDGE.
2. Gives a grasp of BOTH SIDES of an argument.
3. Is INDISPENSABLE for RAPID RECAPITULATION.

The Lancet says of it :—"The work which the Master of Downing College modestly compared to a Note-book is an ADMIRABLE COMPENDIUM of our present information. . . . Will be a REAL ACQUISITION to Students. . . . Gives all ESSENTIAL POINTS. . . . The TYPOGRAPHICAL ARRANGEMENT is a chief feature of the book. . . . Secures at a glance the EVIDENCE on both sides of a theory."

The Hospital says :—"The Physiologist's Note-book bears the hall-mark of the Cambridge School, and is the work of one of the most successful of her teachers. Will be INVALUABLE to Students."

The British Medical Journal commends in the volume—"Its admirable diagrams, its running Bibliography, its clear Tables, and its concise statement of the anatomical aspects of the subject."

⁂ For Dr. Hill's Translation of Prof. Obersteiner's *Central Nervous Organs*, see p. 92.

A ZOOLOGICAL POCKET-BOOK; Or,

Synopsis of Animal Classification. Comprising Definitions of the Phyla, Classes, and Orders, with Explanatory Remarks and Tables. By Dr. EMIL SELENKA, Professor in the University of Erlangen. Authorised English translation from the Third German Edition. By Prof. AINSWORTH DAVIS. In Small Post 8vo, Interleaved for the use of Students. Limp Covers, 4s.

"Dr. Selenka's Manual will be found useful by all Students of Zoology. It is a COMPREHENSIVE and SUCCESSFUL attempt to present us with a scheme of the natural arrangement of the animal world."—*Edin. Med. Journal.*

"Will prove very serviceable to those who are attending Biology Lectures. . . . The translation is accurate and clear."—*Lancet.*

An Elementary Text-Book
OF
BIOLOGY.

BY J. R. AINSWORTH DAVIS, M.A., F.Z.S.,
PROFESSOR OF BIOLOGY, UNIVERSITY COLLEGE, ABERYSTWYTH
EXAMINER IN ZOOLOGY, UNIVERSITY OF ABERDEEN.

SECOND EDITION. In Two Volumes. Sold Separately.

I. VEGETABLE MORPHOLOGY AND PHYSIOLOGY.

General Contents.—UNICELLULAR PLANTS (Yeast-plant, Germs and Microbes, White Mould, Green Mould, &c., &c.)—SIMPLE MULTICELLULAR PLANTS (Wrack, Stoneworts, &c.)—THE MOSS—PTERIDOPHYTES (Bracken and Male Shield Ferns, &c.)—PLANT CELLS AND TISSUES—GYMNOSPERMS (the Fir)—ANGIOSPERMS (Buttercup, Snowdrop)—VEGETATIVE ORGANS OF SPERMAPHYTES—REPRODUCTIVE ORGANS OF ANGIOSPERMS—PHYSIOLOGY OF HIGHER PLANTS—DEVELOPMENT OF ANGIOSPERMS—COMPARATIVE VEGETABLE MORPHOLOGY AND PHYSIOLOGY—CLASSIFICATION OF PLANTS.

With Complete Index-Glossary and 128 *Illustrations.* 8s. 6d.

II. ANIMAL MORPHOLOGY AND PHYSIOLOGY.

General Contents.—PROTOZOA: Amœba (Proteus Animalcule), Vorticella (Bell Animalcule), Gregarina—CŒLENTERATA: Hydra (Fresh-Water Polype), &c.—PLATYHELMIA (Flat-worms): Liver-fluke, Tapeworm—NEMATHELMIA (Thread-worms)—ANNELIDA (Segmented Worms): Earthworm, Leech—ARTHROPODA: Crayfish—MOLLUSCA: Fresh-Water Mussels, Snail—VERTEBRATA ACRANIA: Amphioxus (Lancelet)—PISCES (Fishes): Dogfish—AMPHIBIA: Frog—AVES (Birds): Pigeon and Fowl—MAMMALIA: Rabbit—COMPARATIVE ANIMAL MORPHOLOGY AND PHYSIOLOGY—MAN—CLASSIFICATION and DISTRIBUTION OF ANIMALS.

With Complete Index-Glossary and 108 *Illustrations.* 10s. 6d.

NOTE—The SECOND EDITION has been thoroughly Revised and Enlarged, and includes all the leading selected TYPES in the various Organic Groups.

"Certainly THE BEST 'BIOLOGY' with which we are acquainted. It owes its pre-eminence to the fact that it is an EXCELLENT attempt to present Biology to the Student as a CORRELATED AND COMPLETE SCIENCE."—*British Medical Journal.*

"CLEAR and COMPREHENSIVE."—*Saturday Review.*

"Literally PACKED with information."—*Glasgow Medical Journal.*

DAVIS (Prof): THE FLOWERING PLANT.
(See p. 114.)

DAVIS AND SELENKA: ZOOLOGICAL POCKET-BOOK. (See p. 103.)

Sixth Edition, Revised. With Numerous Illustrations. 5s.

AN INTRODUCTION TO THE STUDY OF
MIDWIFERY.
For the Use of Young Practitioners, Students, and Midwives.

BY

ARCHIBALD DONALD, M.A., M.D., C.M.Edin.,
Obstetric Physician to the Manchester Royal Infirmary; Honorary Surgeon to St. Mary's Hospital for Women, Manchester.

Highly creditable to the Author. . . . Should prove of great value to Midwifery Students and Junior Practitioners."—*British Gynæcological Journal.*

"As an Introduction to the study of Midwifery no better book could be placed in the hands of the Student."—*Sheffield Med. Journal.*

Fourth Edition, Thoroughly Revised. With Illustrations. 7s. 6d.

OUTLINES OF THE
DISEASES OF WOMEN.
A CONCISE HANDBOOK FOR STUDENTS.

By JOHN PHILLIPS, M.A., M.D., F.R.C.P.,
Professor of Obstetric Medicine and the Diseases of Women, King's College Hospital; Senior Physician to the British Lying-in Hospital; Examiner in Midwifery and Diseases of Women, University of London and Royal College of Physicians.

⁂ Dr. Phillips' work is essentially practical in its nature, and will be found invaluable to the student and young practitioner.

"Contains a great deal of information in a very condensed form. . . . The value of the work is increased by the number of sketch diagrams, some of which are highly ingenious."—*Edin. Med. Journal.*

"Dr. Phillips' Manual is written in a succinct style. He rightly lays stress on Anatomy. The passages on case-taking are excellent. Dr. Phillips is very trustworthy throughout in his views on therapeutics. He supplies an excellent series of simple but valuable prescriptions, an indispensable requirement for students."—*Brit. Med. Journal.*

"This excellent text-book . . . gives just what the student requires. . . . The prescriptions cannot but be helpful."—*Medical Press.*

LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.

In Extra Crown 8vo, with Litho-plates and Numerous Illustrations. Cloth, 8*s.* 6*d.*

ELEMENTS OF
PRACTICAL PHARMACY AND DISPENSING.

By W. ELBORNE, B.A.Cantab., F.L.S., F.C.S.,

Demonstrator of Materia Medica and Teacher of Pharmacy at University College, London; Pharmacist to University College Hospital.

GENERAL CONTENTS.

Part I.—Chemical Pharmacy and Laboratory Course.
Part II.—Galenical Pharmacy and Laboratory Course.
Part III.—A Practical Course of Dispensing, with Fac-Similes of Autograph Prescriptions.

"A work which we can very highly recommend to the perusal of all Students of Medicine. . . . Admirably adapted to their requirements."—*Edinburgh Medical Journal.*

"The system . . . which Mr. Elborne here sketches is thoroughly sound."—*Chemist and Druggist.*

⁂ Formerly published under the title of "Pharmacy and Materia Medica."

Crown 8vo. Handsome Cloth. With Diagrams. 7s. 6d. net.

[*Companion Volume to "FERMENTS," by the same Author.*]

TOXINES AND ANTITOXINES.

By CARL OPPENHEIMER, Ph.D., M.D.,

Of the Physiological Institute at Erlangen.

Translated from the German by

C. AINSWORTH MITCHELL, B.A., F.I.C., F.C.S.

With Notes, and Additions by the Author, since the publication of the German Edition.

Deals with the theory of Bacterial, Animal, and Vegetable Toxines, such as Tuberculin, Ricin, Cobra Poison, &c.

" . . . Brings together within the compass of a handy volume, all that is of importance. . . . For wealth of detail we have no small work on toxines which equals the one under review."—*Medical Times.*

Large 8vo, Handsome Cloth. 16s.

LUNATIC ASYLUMS:
THEIR ORGANISATION AND MANAGEMENT.

By CHARLES MERCIER, M.B.,

Lecturer on Neurology and Insanity, Westminster Hospital Medical School; Late Senior Assistant-Medical Officer at Leavesden Asylum, and at the City of London Asylum.

ABSTRACT OF CONTENTS.

Part I.—Housing. Part II.—Food and Clothing. Part III.—Occupation and Amusement. Part IV.—Detention and Care. Part V.—The Staff.

"Will give a much-needed impetus to the study of Asylum Patients."—*Glasgow Medical Journal.*

"When in doubt, look in 'Humphry.'"—*Nursing Record.*

THIRTIETH EDITION, *Revised. With Numerous Illustrations*, 3*s.* 6*d.*

A MANUAL OF NURSING:

Medical and Surgical.

BY LAURENCE HUMPHRY, M.A., M.D., M.R.C.S.,

Physician and late Lecturer to Probationers at Addenbrooke's Hospital, Cambridge; Teacher of Pathology and Examiner in Medicine, University of Cambridge.

GENERAL CONTENTS.—The General Management of the Sick Room in Private Houses—General Plan of the Human Body—Diseases of the Nervous System—Respiratory System—Heart and Blood-Vessels—Digestive System—Skin and Kidneys—Fevers—Diseases of Children—Wounds and Fractures—Management of Child-Bed—Sick-Room Cookery, &c., &c.

"In the fullest sense Dr. Humphry's book is a DISTINCT ADVANCE on all previous Manuals."—*British Medical Journal.*

"We should advise ALL NURSES to possess a copy of the work. We can confidently recommend it as an EXCELLENT GUIDE and companion."—*Hospital.*

In Crown 8vo. Handsome Cloth. 3s. net.

THE TREATMENT OF DISEASES OF THE DIGESTIVE SYSTEM.

BY ROBERT SAUNDBY, M.D., M.Sc., LL.D., F.R.C.P.,

Professor of Medicine in the University of Birmingham, &c.

GENERAL CONTENTS.—Introduction.—The Influence of the General Mode of Life and of Diet upon the Digestive Organs.—Diseases of the Œsophagus: (*a*) Organic; (*b*) Functional.—Diseases of the Stomach: (*a*) Organic; (*b*) Constitutional; (*c*) Functional.—Indications for Operative Interference in Diseases of the Stomach.—Diseases of the Intestines: (*a*) Organic; (*b*) Functional; (*c*) Parasites; (*d*) Diseases of the Rectum. — Symptomatic Diseases.—INDEX.

"The book is written with fulness of knowledge and experience, and is inspired throughout by a sane judgment and shrewd common sense."—*British Medical Journal.*

FOURTH EDITION, *Thoroughly Revised. Handsome Cloth*, 4*s.*

FOODS AND DIETARIES:

A Manual of Clinical Dietetics.

BY R. W. BURNET, M.D., F.R.C.P.,

Physician in Ordinary to H.R.H. the Prince of Wales; Senior Physician to the Great Northern Central Hospital, &c.

GENERAL CONTENTS.—DIET in Diseases of the Stomach, Intestinal Tract, Liver, Lungs, Heart, Kidneys, &c.; in Diabetes, Scurvy, Anæmia, Scrofula, Gout, Rheumatism, Obesity, Alcoholism, Influenza, Nervous Disorders, Diathetic Diseases, Diseases of Children, with a Section on Predigested Foods, and Appendix on Invalid Cookery.

"The directions given are UNIFORMLY JUDICIOUS. . . . May be confidently taken as a RELIABLE GUIDE in the art of feeding the sick."—*Brit. Med. Journal.*

"Dr. Burnet's book will be of great use . . . Deals with BROAD and ACCEPTED VIEWS . . . TREATED with ADMIRABLE SENSE and JUDGMENT."—*Lancet.*

"Should be in the hands of EVERY MOTHER AND NURSE."—*The Nurse* (Boston).

FIFTH EDITION, *Revised. Handsome Cloth. Price* 5*s*.

THE WIFE AND MOTHER:

A Medical Guide to the Care of Health and the Management of Children.

BY ALBERT WESTLAND, M.A., M.D., C.M.

GENERAL CONTENTS:—PART I.—Early Married Life. PART II.—Early Motherhood. PART III.—The Child, in Health and Sickness. PART IV.—Later Married Life.

"WELL-ARRANGED, and CLEARLY WRITTEN."—*Lancet.*

"THE BEST BOOK of its kind. . . May be read from cover to cover with advantage."—*Medical Press.*

"A REALLY EXCELLENT BOOK."—*Aberdeen Journal.*

"EXCELLENT AND JUDICIOUS."—*Western Daily Press.*

"The best book I can recommend is 'THE WIFE AND MOTHER,' by Dr. ALBERT WESTLAND, published by Messrs. Charles Griffin & Co. It is a MOST VALUABLE work, written with discretion and refinement."—*Hearth and Home.*

"Will be WELCOMED by every young wife . . . abounds with valuable advice"—*Glasgow Herald.*

SECOND EDITION, Thoroughly Revised throughout.
In Large Crown 8vo. Cloth.

INFANCY AND INFANT-REARING:

A Guide to the Care of Children in Early Life.

BY JOHN BENJ. HELLIER, M.D.,

Surg. to the Hosp. for Women and Children, Leeds; Lect. on Diseases of Women and Children, Yorkshire College, Leeds; Examiner in the Victoria University.

With Illustrations.

GENERAL CONTENTS.—Normal Growth and Development in the first Two Years of Life: The New-born Child—Signs of Maturity—The Bony System—Nervous System—Development of Special Senses—Teething. **Difficulties of Infant-Rearing:** Statistics of Mortality. **Causes of Mortality:** Improper Feeding—Sour and Diseased Milk. **Special Diseases of Infancy:** Gastro-enteric Catarrh—Rickets—Scurvy Rickets—Thrush—Rheumatism—Causes which hinder Thriving. **Infant-Feeding: Natural Feeding**—Wet Nurses and their Diet—Influence of Alcohol and Drugs. **Artificial Feeding:** Humanising Cow's Milk—Peptonising—Sterilising—Precautions—Feeding-Bottles—Milk of other Animals—Diet in Scurvy Rickets, &c. **General Hygiene of Infants:** Cleanliness—Warmth—Ventilation—Sleep—Out-door Exercise—Nursery Arrangements—Shortening. **Special Care of New-born Children—Care of Premature Infant:** Tarnier's Couveuse and Mode of using it. **Hygiene of Dentition—Special Conditions observed in Infancy.**

"THOROUGHLY PRACTICAL. . . . A MINE of information."—*Public Health.*

GRIFFIN'S "FIRST AID" PUBLICATIONS.

On Land.

FIFTH EDITION, *Thoroughly Revised. Large Crown 8vo.*
Handsome Cloth. 4s.

A MANUAL OF AMBULANCE.

BY J. SCOTT RIDDELL, M.V.O., C.M., M.B., M.A.,

Senior Surgeon and Lecturer on Clinical Surgery, Aberdeen Royal Infirmary; Examiner in Clinical Surgery to the University of Edinburgh; Examiner to the St. Andrew's Ambulance Association Glasgow, and the St. John Ambulance Association, London.

With Numerous Illustrations and 6 Additional Full Page Plates.

General Contents.—Outlines of Human Anatomy and Physiology—The Triangular Bandage and its Uses—The Roller Bandage and its Uses—Fractures—Dislocations and Sprains—Hæmorrhage—Wounds—Insensibility and Fits—Asphyxia and Drowning Suffocation—Poisoning—Burns, Frost-bite, and Sunstroke—Removal of Foreign Bodies from (*a*) The Eye; (*b*) The Ear; (*c*) The Nose; (*d*) The Throat; (*e*) The Tissues—Ambulance Transport and Stretcher Drill—The After-treatment of Ambulance Patients—Organisation and Management of Ambulance Classes—Appendix: Examination Papers on First Aid.

"A CAPITAL BOOK. . . . The directions are SHORT and CLEAR, and testify to the hand of an able surgeon."—*Edin. Med. Journal.*

"This little volume seems to us about as good as it could possibly be. . . . Contains practically every piece of information necessary to render First aid. . . . Should find its place in EVERY HOUSEHOLD LIBRARY."—*Daily Chronicle.*

"So ADMIRABLE is this work, that it is difficult to imagine how it could be better.'—*Colliery Guardian.*

At Sea.

THIRD EDITION, *Revised. Crown 8vo, Extra.*
Handsome Cloth. 6s.

A MEDICAL AND SURGICAL HELP
FOR SHIPMASTERS AND OFFICERS IN THE MERCHANT NAVY.

INCLUDING

FIRST AID TO THE INJURED.

BY WM. JOHNSON SMITH, F.R.C.S.,

Consulting Surgeon to the Seamen's Hospital, Greenwich, and to the Branch (Seamen's) Hospital, Royal Albert Docks.

With 2 Coloured Plates, Numerous Illustrations, and latest Regulations respecting Medical Stores on Board Ship.

*** The attention of all interested in our Merchant Navy is requested to this exceedingly useful and valuable work. It is needless to say that it is the outcome of many year's PRACTICAL EXPERIENCE amongst Seamen.

"SOUND, JUDICIOUS, REALLY HELPFUL."—*The Lancet.*

"It would be difficult to find a Medical and Surgical Guide more clear and comprehensive than Mr. JOHNSON SMITH, whose experience at the GREENWICH HOSPITAL eminently qualifies him for the task. . . . We RECOMMEND the work to EVERY Shipmaster and Officer."—*Liverpool Journal of Commerce.*

LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.

THIRTEENTH EDITION, Thoroughly Revised. The Appendix on Sanitary Law being Entirely Re-Written for this Edition. Price 6s.

PRACTICAL SANITATION:

A HAND-BOOK FOR SANITARY INSPECTORS AND OTHERS INTERESTED IN SANITATION.

BY GEORGE REID, M.D., D.P.H.,

Fellow and Examiner, Sanitary Institute of Great Britain, and Medical Officer to the Staffordshire County Council.

WITH AN APPENDIX ON SANITARY LAW.

BY HERBERT MANLEY, M.A., M.B., D.P.H.,

Fellow of Sanitary Institute; Barrister-at-Law; Medical Officer of Health for the County Borough of West Bromwich.

GENERAL CONTENTS.—Introduction.—Water Supply: Drinking Water, Pollution of Water.—Ventilation and Warming.—Principles of Sewage Removal.—Details of Drainage: Refuse Removal and Disposal.—Sanitary and Insanitary Work and Appliances.—Details of Plumbers' Work.—House Construction.—Infection and Disinfection.—Food, Inspection of; Characteristics of Good Meat; Meat, Milk, Fish, &c., unfit for Human Food.—Appendix: Sanitary Law; Model Bye-Laws, &c.

"Dr. Reid's very useful Manual . . . ABOUNDS IN PRACTICAL DETAIL." —*British Medical Journal.*

In Handsome Cloth. With 53 Illustrations. 3s. 6d. net.

LESSONS ON SANITATION.

BY JOHN WM. HARRISON, M.R.SAN.I.,

Mem. Incor. Assoc. Mun. and County Engineers; Surveyor, Wombwell, Yorks.

CONTENTS.—Water Supply.—Ventilation.—Drainage.—Sanitary Building Construction.—Infectious Diseases.—Food Inspection.—Duties of an Inspector of Nuisances and Common Lodging-Houses.—Infectious Diseases Acts.—Factory and Workshop Acts.—Housing of the Working-Classes Act.—Shop Hours Acts.—Sale of Food and Drugs Acts.—The Margarine Acts.—Sale of Horseflesh, &c.—Rivers Pollution.—Canal Boats Act.—Diseases of Animals.—Dairies, Cowsheds, and Milkshops Order.—Model Bye-Laws.—Miscellaneous.—INDEX.

"The Questions and Answers it contains are both complete and satisfactory."—*British Sanitarian.*

By WILLIAM NICHOLSON.

SMOKE ABATEMENT.

Fully Illustrated. Price 6s. *net.*

In Crown 8vo. With Illustrations. 5s. *net.*

METHODS AND CALCULATIONS IN

HYGIENE AND VITAL STATISTICS

BY H. W. G. MACLEOD, M.D., C.M., D.P.H.

Arranged on the Principle of Question and Answer.

ABSTRACT OF CONTENTS.—Chemistry.—Specific Gravity.—Meteorology.—Ventilation.—Water.—Drainage and Sewage.—Diet and Energy.—Logarithms.—Population (Vital Statistics).

"Dr. Macleod's book will be found useful to a large number of workers."—*Journal of Army Medical Corps.*

In Large Crown 8vo. Fully Illustrated. 6s. net.

THE INVESTIGATION OF MINE AIR:

An Account by Several Authors of the Nature, Significance, and Practical Methods of Measurement of the Impurities met with in the Air of Collieries and Metalliferous Mines.

EDITED BY

SIR CLEMENT LE NEVE FOSTER, D.Sc., F.R.S.,

AND J. S. HALDANE, M.D., F.R.S.

"We know of nothing essential that has been omitted. The book is liberally supplied with illustrations of apparatus."—*Colliery Guardian.*

In Crown 8vo. With Frontispiece. Handsome Cloth. 6s.

THE HYGIENIC PREVENTION OF

CONSUMPTION.

BY J. EDWARD SQUIRE, M.D., D.P.H.Camb.,

Physician to the North London Hospital for Consumption and Diseases of the Chest, &c

"We can safely say that Dr. SQUIRE'S work WILL REPAY STUDY even by the most cultivated physician."—*The Lancet.*

For other Standard Works on Sanitation

SEE

NAYLOR'S TRADES' WASTE,	*See General Catalogue,* Page	76
WOOD'S SANITARY ENGINEERING,	,, ,,	78
NICHOLSON'S SMOKE ABATEMENT,	,, ,,	76

See also "LOCAL GOVERNMENT HANDBOOKS," page 47 *General Catalogue.*

With Diagrams, Demy 8vo, 472 pp. 12s. 6d.

ESSAYS IN HEART AND LUNG DISEASES.

BY ARTHUR FOXWELL, M.A., M.D.Cantab., F.R.C.P.Lond.,

Physician to the Queen's Hospital, Birmingham; Examiner in Medicine, University of Cambridge.

General Contents.—ON DYSPNŒA—EXPECTORATION IN PHTHISIS—ON CATARRH (A. Acute Pneumonia in Children; B. Acute Laryngitis in Children; C. Acute Primary Peritonitis; D. Catarrhus)—ON CLIMATE (A. The Davos and Engadine Valleys; B. Arosa, a Hamlet in the Grisons; C. The Climatic Treatment of Tubercular Phthisis)—NON-TUBERCULAR PULMONARY CAVITIES—THE CURABILITY AND PROGNOSIS OF PHTHISIS—THE VASCULAR SYSTEM IN ANÆMIC DEBILITY—ARTERIAL HIGH TENSION—CONGESTION OF THE LUNGS—ON HÆMOPTYSIS—THE ANTISEPTIC TREATMENT OF TUBERCULAR PHTHISIS.

"These ADMIRABLE Essays."—*Brit. Med. Journal.*

FIFTH EDITION, Thoroughly Revised, Greatly Enlarged and Re-written.
With additional Tables, Plates, and Illustrations. 21s.

FOODS:
THEIR COMPOSITION AND ANALYSIS.

BY A. WYNTER BLYTH, M.R.C.S., F.IC., F.C.S.,
Barrister-at-Law, Public Analyst for the County of Devon, and
Medical Officer of Health for St. Marylebone.

AND M. WYNTER BLYTH, B.A., B.Sc., F.C.S.

GENERAL CONTENTS. — History of Adulteration. — Legislation. — Apparatus. — "Ash." — Sugar. — Confectionery. — Honey. — Treacle. — Jams and Preserved Fruits. — Starches. — Wheaten-Flour. — Bread. — Oats. — Barley. — Rye. — Rice. — Maize. — Millet. — Potatoes. — Peas. — Lentils. — Beans. — **Milk.** — Cream. — Butter. — Oleo-Margarine. — Cheese. — Lard. — Tea. — Coffee. — Cocoa and Chocolate. — **Alcohol.** — Brandy. — Rum. — Whisky. — Gin. — Arrack. — Liqueurs. — Absinthe. — Yeast. — Beer. — Wine. — Vinegar. — Lemon and Lime Juice. — Mustard. — Pepper. — Sweet and Bitter Almonds. — Annatto. — Olive Oil. — **Water Analysis.** — **Appendix:** Adulteration Acts, &c.

"Simply INDISPENSABLE in the Analyst's laboratory."—*The Lancet.*

"A new edition of Mr. Wynter Blyth's Standard work, ENRICHED WITH ALL THE RECENT DISCOVERIES AND IMPROVEMENTS, will be accepted as a boon."—*Chemical News.*

FOURTH EDITION, Thoroughly Revised. In Large 8vo, Cloth, with
Tables and Illustrations. 21s. net.

POISONS:
THEIR EFFECTS AND DETECTION.

BY A. WYNTER BLYTH, M.R.C.S., F.I.C., F.C.S.,
Barrister-at-Law, Public Analyst for the County of Devon, and
Medical Officer of Health for St. Marylebone.

GENERAL CONTENTS.

I.—Historical Introduction. II.—Classification—Statistics—Connection between Toxic Action and Chemical Composition—Life Tests—General Method of Procedure—The Spectroscope—Examination of Blood and Blood Stains. III.—Poisonous Gases. IV.—Acids and Alkalies. V.—More or less Volatile Poisonous Substances. VI.—Alkaloids and Poisonous Vegetable Principles. VII.—Poisons derived from Living or Dead Animal Substances. VIII.—The Oxalic Acid Group. IX.—Inorganic Poisons. *Appendix:* Treatment, by Antidotes or otherwise, of Cases of Poisoning.

"Undoubtedly THE MOST COMPLETE WORK on Toxicology in our language."—*The Analyst (on the Third Edition).*

"As a PRACTICAL GUIDE, we know NO BETTER work."—*The Lancet (on the Third Edition).*

⁂ In the THIRD EDITION, Enlarged and partly Re-written, NEW ANALYTICAL METHODS have been introduced, and the CADAVERIC ALKALOIDS, or PTOMAINES, bodies playing so great a part in Food-poisoning and in the Manifestations of Disease, have received special attention.

GRIFFIN'S INTRODUCTORY SCIENCE SERIES.

FULLY ILLUSTRATED.

BOTANY.	OPEN-AIR STUDIES IN BOTANY. By R. Lloyd Praeger, B.A., M.R.I.A.,	7/6
	THE FLOWERING PLANT. By Prof. Ainsworth Davis. Third Edition,	3/6
	HOW PLANTS LIVE AND WORK. By Eleanor Hughes-Gibb,	2/6
	THE MAKING OF A DAISY. By Eleanor Hughes-Gibb,	2/6
BIRD-LIFE.	OPEN-AIR STUDIES IN BIRD-LIFE. By Charles Dixon,	7/6
CHEMISTRY.	INORGANIC CHEMISTRY. By Prof. Dupré, F.R.S., and Dr. Wilson Hake. Third Edition, Re-issued,	6/ net.
	THE THRESHOLD OF SCIENCE. By Dr. Alder Wright. Second Edition,	6/
	CHEMICAL RECREATIONS. By J. J. Griffin, F.C.S. Tenth Edition, Complete, (Or in 2 parts, sold separately.)	12/6
GEOLOGY.	OPEN-AIR STUDIES IN GEOLOGY. By Prof. G. A. J. Cole, F.G.S., M.R.I.A. Second Edition,	8/6
ENGINEERING DRAWING.	I. PRACTICAL GEOMETRY, Fifth Edition,	4/6
	II. MACHINE DESIGN, Fourth Edition. By S. H. Wells, A.M.Inst.C.E.	4/6
MAGNETISM & ELECTRICITY.	By Prof. Jamieson, late of the Glasgow and West of Scotland Technical College. Seventh Edition,	3/6
MECHANICS.	By Prof. Jamieson. Eighth Edition,	3/6
THE STEAM ENGINE.	By Prof. Jamieson. Eleventh Edition,	3/6
METALLURGY.	By Prof. Humboldt Sexton, Glasgow and West of Scotland Technical College. Fourth Edition, Revised,	6/
PHYSICS.	A TEXT-BOOK OF PHYSICS: By J. H. Poynting, Sc.D., F.R.S., and J. J. Thomson, M.A., F.R.S.	
	Vol. I.—Properties of Matter. Fourth Edition,	10/6
	Vol. II.—Sound. Fourth Edition,	8/6
	Vol. III.—Heat. Second Edition,	15/
PHOTOGRAPHY.	By A. Brothers, F.R.A.S. Second Edition,	21/

LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.

THIRD EDITION, Revised and Enlarged. Large Crown 8vo, with numerous Illustrations. 3s. 6d.

THE FLOWERING PLANT,

WITH A SUPPLEMENTARY CHAPTER ON FERNS AND MOSSES,

As Illustrating the First Principles of Botany.

BY J. R. AINSWORTH DAVIS, M.A., F.Z.S.,

Prof. of Biology, University College, Aberystwyth; Examiner in Zoology, University of Aberdeen.

"It would be hard to find a Text-book which would better guide the student to an accurate knowledge of modern discoveries in Botany. . . . The SCIENTIFIC ACCURACY of statement, and the concise exposition of FIRST PRINCIPLES make it valuable for educational purposes. In the chapter on the Physiology of Flowers, an *admirable résumé*, drawn from Darwin, Hermann Müller, Kerner, and Lubbock, of what is known of the Fertilization of Flowers, is given."—*Journal of Botany.*

POPULAR WORKS ON BOTANY BY MRS. HUGHES-GIBB.

With Illustrations. Crown 8vo. Cloth. 2s. 6d.

HOW PLANTS LIVE AND WORK:

A Simple Introduction to Real Life in the Plant-world, Based on Lessons originally given to Country Children.

BY ELEANOR HUGHES-GIBB.

⁂ The attention of all interested in the Scientific Training of the Young is requested to this DELIGHTFULLY FRESH and CHARMING LITTLE BOOK. It ought to be in the hands of every Mother and Teacher throughout the land.

"The child's attention is first secured, and then, in language SIMPLE, YET SCIENTIFICALLY ACCURATE, the first lessons in plant-life are set before it."—*Natural Science.*

"In every way well calculated to make the study of Botany ATTRACTIVE to the young."—*Scotsman*

With Illustrations. Crown 8vo. Gilt, 2s. 6d.

THE MAKING OF A DAISY;

"WHEAT OUT OF LILIES;"

And other Studies from the Plant World.

A Popular Introduction to Botany.

BY ELEANOR HUGHES-GIBB,

Author of *How Plants Live and Work.*

"A BRIGHT little introduction to the study of Flowers."—*Journal of Botany.*

"The book will afford real assistance to those who can derive pleasure from the study of Nature in the open. . . . The literary style is commendable."—*Knowledge.*

LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.

"BOYS COULD NOT HAVE A MORE ALLURING INTRODUCTION to scientific pursuits than these charming-looking volumes."—Letter to the Publishers from the Head-master of one of our great Public Schools.

Handsome Cloth, 7s. 6d. Gilt, for Presentation, 8s. 6d.

OPEN-AIR STUDIES IN BOTANY:

SKETCHES OF BRITISH WILD FLOWERS IN THEIR HOMES.

BY R. LLOYD PRAEGER, B.A., M.R.I.A.

Illustrated by Drawings from Nature by S. Rosamond Praeger, and Photographs by R. Welch.

GENERAL CONTENTS.—A Daisy-Starred Pasture—Under the Hawthorns—By the River—Along the Shingle—A Fragrant Hedgerow—A Connemara Bog—Where the Samphire grows—A Flowery Meadow—Among the Corn (a Study in Weeds)—In the Home of the Alpines—A City Rubbish-Heap—Glossary.

"A FRESH AND STIMULATING book . . . should take a high place . . . The Illustrations are drawn with much skill."—*The Times.*

"BEAUTIFULLY ILLUSTRATED. . . . One of the MOST ACCURATE as well as INTERESTING books of the kind we have seen."—*Athenæum.*

"Redolent with the scent of woodland and meadow."—*The Standard.*

With 12 Full-Page Illustrations from Photographs. Cloth. Second Edition, Revised. 8s. 6d.

OPEN-AIR STUDIES IN GEOLOGY:

An Introduction to Geology Out-of-doors.

BY GRENVILLE A. J. COLE, F.G.S., M.R.I.A.,

Professor of Geology in the Royal College of Science for Ireland, and Examiner in the University of London.

GENERAL CONTENTS.—The Materials of the Earth—A Mountain Hollow—Down the Valley—Along the Shore—Across the Plains—Dead Volcanoes—A Granite Highland—The Annals of the Earth—The Surrey Hills—The Folds of the Mountains.

"The FASCINATING 'OPEN-AIR STUDIES' of PROF. COLE give the subject a GLOW OF ANIMATION . . . cannot fail to arouse keen interest in geology."—*Geological Magazine.*

"A CHARMING BOOK, beautifully illustrated."—*Athenæum.*

Beautifully Illustrated. With a Frontispiece in Colours, and Numerous Specially Drawn Plates by Charles Whymper. 7s. 6d.

OPEN-AIR STUDIES IN BIRD-LIFE:

SKETCHES OF BRITISH BIRDS IN THEIR HAUNTS.

BY CHARLES DIXON.

The Spacious Air.—The Open Fields and Downs.—In the Hedgerows.—On Open Heath and Moor.—On the Mountains.—Amongst the Evergreens.—Copse and Woodland.—By Stream and Pool.—The Sandy Wastes and Mud-flats.—Sea-laved Rocks.—Birds of the Cities.—INDEX.

"Enriched with excellent illustrations. A welcome addition to all libraries."—*Westminster Review.*

A BOOK NO FAMILY SHOULD BE WITHOUT.

THIRTY-EIGHTH EDITION. *Royal 8vo, Handsome Cloth,* 10*s.* 6*d.*

A DICTIONARY OF
Domestic Medicine and Household Surgery,

BY

SPENCER THOMSON, M.D., L.R.C.S. (Edin.),

AND

J. CHARLES STEELE, M.D., Late of Guy's Hospital.

THOROUGHLY REVISED AND BROUGHT DOWN TO THE PRESENT STATE OF MEDICAL SCIENCE

BY

ALBERT WESTLAND, M.A., M.D.,
AUTHOR OF "THE WIFE AND MOTHER";

AND

GEO. REID, M.D., D.P.H.,
MEDICAL OFFICER TO THE STAFFORDSHIRE COUNTY COUNCIL.

With a Section on the Maintenance of Health and the Management of Disease i Warm Climates by JAS. CANTLIE, M.A., M.B., F.R.C.S., Lecturer on Applied Anatomy, Charing Cross Hospital; Surgeon, West-end Hospital for Nervous Diseases; formerly Surgeon, Charing Cross Hospital; Dean of the College of Medicine, Hong Kong, &c., &c.;

AND AN

Appendix on the Management of the Sick-room, and many Hints for the Diet and Comfort of Invalids.

In its new Form, DR. SPENCER THOMSON'S "DICTIONARY OF DOMESTIC MEDICINE" fully sustains its reputation as the "Representative Book of the Medical Knowledg and Practice of the Day" applied to Domestic Requirements.

The most recent IMPROVEMENTS in the TREATMENT OF THE SICK—in APPLIANCE for the RELIEF OF PAIN—and in all matters connected with SANITATION, HYGIENE, an the MAINTENANCE of the GENERAL HEALTH—will be found in the Present Issue in clea and full detail; the experience of the Editors in the Spheres of Private Practice, o Hospital Treatment, of Sanitary Supervision, and of Life in the Tropics respectively, combining to render the Dictionary perhaps the most thoroughtly practical work of th kind in the English Language. Many new Engravings have been included—improve Diagrams of different parts of the Human Body, and Illustrations of the newest Medical, Surgical, and Sanitary Apparatus.

*** *All Directions given in such a form as to be readily and safely followed.*

FROM THE AUTHOR'S PREFATORY ADDRESS.

"Without entering upon that difficult ground which correct professional knowledge and educated judgment can alone permit to be safely trodden, there is a wide and extensive field for exertion, and fo usefulness, open to the unprofessional, in the kindly offices of a *true* DOMESTIC MEDICINE, the timely help and solace of a simple HOUSEHOLD SURGERY, or, better still, in the watchful care more generally known as 'SANITARY PRECAUTION,' which tends rather to preserve health than to cure disease. 'The touch of a gentle hand' will not be less gentle because guided by knowledge, nor will the *safe* domestic remedies be less anxiously or carefully administered. Life may be saved, suffering may always be alleviated. Even to the resident in the midst of civilisation, the 'KNOWLEDGE IS POWER,' to do good; to the settler and emigrant it is INVALUABLE."

"Dr. Thomson has fully succeeded in conveying to the public a vast amount of useful professional knowledge."—*Dublin Journal of Medical Science.*

"The amount of useful knowledge conveyed in this Work is surprising."—*Medical Times and Gazette.*

"WORTH ITS WEIGHT IN GOLD TO FAMILIES AND THE CLERGY."—*Oxford Herald.*

LONDON: CHARLES GRIFFIN & CO., LIMITED, EXETER STREET, STRAND.